

Authentic Science

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No. 56



PROFESSOR
A. M. LOW

writes
about

TRANSPORT
in the
FUTURE

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ONE SHILLING and SIXPENCE

Authentic

SCIENCE-FICTION MONTHLY

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H. J. CAMPBELL

Writes...

A lot of you will be pleased to see that Bryan Berry is back again with the lead story in this issue. Bryan has been very busy with other things—mainly painting—for some time, but now he has come back to the fold with this story, specially written for *Authentic*. Hope you like it.

Stories by Jonathan Burke are usually welcomed by most readers, and we have pleasure in presenting another this month. George Holt and George C. Duncan add to your pleasure with their two finest stories in thoughtful mood. You know Duncan, but tell me what you think of Holt, will you?

The articles cover quite a range this month. Professor A. M. Low gives us the first in a new series dealing with various aspects of the world of the future. Walter Graham tells us a few things about navigation under various conditions. Douglas Chatt has some interesting information on electronic brains. And Peter Summers gives us an-

other of his biological pieces, all about creeping around on our hands and knees.

The supplement gets better and better, I hope you will agree. Unfortunately, we seem to have bitten off a bit more than we can chew with this feature, for the cost of the art paper has become too great. We'll have to dispense with it, I'm afraid. But you'll still get the illustrated articles; we are going to have especially good blocks made that will reproduce nicely on our ordinary paper. So the illustrated supplement will go on appearing, but not on art paper any more. Sorry about that. Still, it means that we can spread the illustrations throughout the magazine, rather than having them all together.

About our Poll—so many completed slips are still coming in that I have decided to delay analysis for a while. Our overseas readers seem just as keen to get in on the running of *Authentic*, and, of course, their replies take rather longer to reach us. I hope to

have some results for you next month. Meanwhile, there is one result that stands out very clearly—a great many readers want serials—not the kind that go on and on, but in just two or three instalments.

So, bowing to your wishes, as we so often do, I am arranging to get a few serials for you. This is not going to be easy, for few authors write stories that can be published in so few parts. However, we are lucky with our first, which will be published in two instalments starting next month. This will be "The Big Hop" by well-known author J. T. McIntosh. Many of you have asked for stories by J. T. Now you've got 'em!

As you read this, the National Science Fiction Convention for 1955 will have just about drawn to a close. Next year, maybe, things will have "hotted up" considerably in the convention field, for the wheels are turning to make London the site of the World Science Fiction Convention.

All of these so far have been held in one of the major American cities. When I went to the 1953 World Convention in Philadelphia, I suggested that London would make a good place, too. Nobody out there seemed to

have thought of it before. Anyway, the word went around and it became obvious that very many American fans would welcome the chance to come to England, using the Convention as a convenient excuse!

Just about now a number of prominent fans in England and my good friend John Carnell are "rooting" for it in no mean manner. Propaganda is winging its way across the Atlantic and spreading throughout the States. Quite a furore is being worked up. With a bit of luck, the stout yeoman work of British fans may see fruition and the cry will be a definite "London in '56!"

If that happens, I can promise you that London will never have seen the like of next year's convention. With masses of Americans and continental Europeans converging on the city, taking over a whole first-class hotel, it will be the finest piece of advertising that science fiction has ever had.

So, if you have any means at all of spreading the word, I advise you to do so. Write to your American friends, tell everybody what a wonderful time they'll have if they come to "London in '56!"

*It was impossible. Nevertheless
someone committed a—*

Strange Suicide

by BRYAN BERRY

DR. JAKSN IS FREE now, Mr. Lorens," the secretary said, smiling at him and snapping the toggle of the tiny visor screen on her desk. "Go straightin, won't you, please?"

The man called Lorens stood up, smiling faintly in reply, and limped across towards the door at the far end of the anteroom. He was acutely conscious of his dusty appearance. "In here?" he asked.

"That's right."

It's more than strange, thought the man called Lorens, his hand reaching for the door. Much more than strange. Here am I, a complete nonentity—and *what* a complete nonentity!—arriving here without an appointment and I have only three minutes wait before getting in to see

this doctor. Much more than strange.

He pushed the door and went into the inner room.

Behind a plastoid desk, from a null-grav foam cushion, rose a large, tanned man who wore one of the ultra-fashionable clingersuits of golden plastoid, the V-neck of which ended near his belt buckle, exposing a small jungle of thick hair on his chest. "Mr. Lorens?"

"That—that's right."

"Welcome. You had a good trip?" The man's bright eyes brightened as he took in the dusty coveralls. "No," he went on, his voice lower. "No, I see you didn't." He looked over Lorens' shoulder at the door, then back again, questioning the newcomer with his eyes.

The man called Lorens

blinked uncertainly. He felt suddenly as though he was on the point of waking from a dream. Here was a man he had never seen in his life before asking him if he had had a good trip and treating him as if he had been an old friend. And now, since the doctor had apparently noticed his rumpled condition, the good humour and welcome in his eyes had given way, it seemed, to something like—well, like *fear*.

The doctor moved swiftly to the door of the anteroom. "Lora!" he called.

"Yes, Dr. AndrUz?"

"If any visor calls come through for me say I'm out on an urgent case and probably won't be back until tomorrow. Out to callers, too. Sav?"

"Sav," the voice acknowledged.

Dr. AndrUz closed the door and slowly turned to face his visitor. "Trouble?" he asked cautiously, his eyes on the dusty coveralls once more.

The man called Lorens pointed vaguely to a null-grav cushion. "May I——"

"Of course. Here—I'll get you a drink and a kiksule."

The visitor slumped into the cushion and closed his eyes. The throbbing in his head had abated somewhat but his limbs still ached.

Dr. AndrUz brought a tray over to him. "Tired?"

He snapped his eyes open. "Huh? Oh, yes. Tired." On the tray was a glass of golden fluid and three small red kiksules. He swallowed the pills and drained the glass.

AndrUz pulled another cushion near and straddled it. "Tell," he said. "You're three hours late and you look as though you've been beaten up. You arrive here without visoring through to me and you haven't said a word about anything."

But what could he say, the man called Lorens wondered. How could he explain about the crash in the flycar and his subsequent realisation that everything previous to his recovery of consciousness was completely lost to him? How could he say that the only thing that had led him here, to this doctor who had seemingly been expecting him to call several hours before,

had been a vague, ephemeral dream-voice repeating the man's name over and over to him in his mind as he came to after the crash. That name, together with information he had gathered from an examination of the contents of his pockets, had led him here, to this room and this man.

AndrUz leaned closer to him. "If you're wondering whether we can be overheard I can assure you we're quite safe."

Lorens shook his head. "No. No, it's not that. It's—it's . . ."

"Well?"

"I—I've lost my memory. I crashed in a flycar on my way from Lundn. When—when I came to I didn't know who I was or where I was going or—or anything. The only thing I could recall was the name 'AndrUz' and—and when I turned my pockets out I found enough information to lead me here, to you."

"What's your name?" snapped AndrUz.

"Uh—Lorens. PorLorens."

"Did you know that when

you came to or did you have to look at your identity tags?"

"I had to look at the tags."

AndrUz fetched a null-grav table. "Turn your pockets out," he said, briefly.

Lorens stared at him. "But wha . . .?"

"Turn your pockets out. You came to me for a purpose that I knew and you don't—apparently. I want proof that you are the man I was expecting."

Lorens nodded and started emptying his pockets. As he put each article down on the table AndrUz picked it up and examined it.

"Well?"

"That the lot?"

Lorens nodded. "That's everything except for the credit notes I spent getting here by turbocar after the crash."

"Did you have any baggage in this flycar?"

"Yes, one grip."

AndrUz looked alarmed. "You left it near the wreck?"

"No, I brought it with me but checked it in at the multiservis before coming

here, since I thought you might not be in and I didn't want to drag it about if . . ."

The doctor didn't wait for him to finish but crossed to his desk visor, saying as he did so: "You can give them instructions to have it sent here immediately, express service."

Lorens nodded and followed the doctor to the visor. AndrUz cut off all inter-office contacts and dialled the multiservis. When the screen cleared to show the robot operator, Lorens spoke. "I booked a travelling grip in with you a few hours ago. I'd like it sent express service to Dr. MIkL AndrUz, at 437B, 7th Lane, Upper Level, NU Solsbry. Carriage paid this end."

"One moment, please."

Lorens eased the collar of his coveralls. The throbbing was starting again. The throbbing and the questions and the sense of dreaming and unreality.

The visor screen blurred, then cleared to show a picture of a travelling grip. "Is this the article you require?"

"It is."

"Identification, please."

Lorens picked his tags from the table and held them in front of the screen. A minute later the robot's voice announced that the grip would be sent off immediately.

AndrUz switched off the visor, his eyes on Lorens. "They'll only take five minutes or so to get here with it," he said. "While we're waiting I just want to check up on your belongings again." He turned once more to the table that contained the contents of Lorens' pockets.

I came here for a purpose, Lorens thought. But *what* purpose? And why won't he tell me what it is? Surely if I'd met him before he'd know me sufficiently well to trust his own eyes. And if not, then what sort of association is there between us that demands so much secretive checking? He watched the doctor for a moment or two, then asked: "Dr. AndrUz, presuming that I *am* the man you were expecting, can you tell me, please, whether we've met before? When you first saw me you acted as though you recognised me, yet if you

did, why should you go to all this trouble to check up on me?"

AndrUz looked up, and Lorens noticed for the first time that his face and chest were wet with sweat. The man was obviously not simply afraid of something—he was terrified. But terrified of what? Of Lorens himself? No; from the anxious glances he gave towards the door of the anteroom it seemed more likely that the thought of interruption was frightening him.

AndrUz did not answer him. Instead he went to the door and called out instructions to his secretary. "Lora—there's an express delivery from Multiservis arriving soon. My friend, Mr.—er, Mr. Lorens, is expecting it."

The doctor closed the door and turned to his visitor. "I don't feel we should discuss anything until I've made these checks," he said. He bent over the little pile of papers and objects once again. On the wall behind him the electric clock soundlessly informed the two men of the passing of implacable time.

When the doctor's secretary

announced that the Multiservis robot had arrived with the package AndrUz hustled his companion out into the anteroom so that his identification could be checked. This completed, and the Multiservis fee paid over, the robot left and the two men retired once more to the consulting room.

"What do you expect to find out from my grip?" Lorens wanted to know. He felt the whole thing was becoming farcical. He still knew nothing about himself, and from the doctor's nervous attitude he was beginning to suspect that he was in some way involved in a felonious activity.

After examining the contents of the grip, AndrUz brought out a small machine from the surgery that adjoined his consulting room. He set the machine on a null-grav beam so that it was suspended over his desk, then he passed Lorens' possessions under it, viewing each very carefully through an aperture in the machine. From this Lorens gathered that the device was some sort of X-ray.

After the third or fourth article, AndrUz turned and said: "I want you to undress. Go into that cubicle, take off everything you're wearing and bring it out to me. There's a robe in there you can wear."

Lorens shrugged and strode towards the curtained cubicle. Presumably the man knew what he was doing and presumably, too, there would be little likelihood of learning anything further if he refused to co-operate.

When he returned AndrUz took his clothes and passed them with great care under the machine while Lorens looked on.

"If you'd only tell me what you're looking for . . ."

"I think I've found it," grunted AndrUz, studying the shirt that his visitor had been wearing. "Yes. This is it." He pulled the shirt out from under the machine and, with a small pair of scissors, removed a portion of the cuff; this he pocketed with great deliberation.

Lorens saw the strain and anxiety drain away from the man's face. The relief that

took its place made the transformation almost comical.

AndrUz looked him straight in the eye and smiled. "Yes," he said, softly. "You're the man I was expecting—if 'man' is quite the right word . . ."



General Lee of the Scotyard Security Police snapped the toggle of the wall visor and said: "Well, what is it? I told you that I wasn't to be disturbed, didn't I?"

"Yes, sir, but I've had a report of a—of an anti-state felony Class One, sir, and I thought . . ."

"What! Don't be a fool, man; there hasn't been such a thing for fifty years or more."

The secretary's face grew mottled on the screen. "Well, sir, I've got this report and I'm holding Over-Inspector Kristofr on the other line, and he says——"

"Kristofr?" the general blurred. "Well, put him on."

"Yes, sir. Immediately, sir."

Incredible that Kristofr should make a stupid mistake like that. Kristofr of all people.

Ought to have his head examined. Must be getting too old for his job.

The screen blinked and winked and supplied the lean face of Over-Inspector Kristofr.

"Now, what is all this nonsense?" General Lee wanted to know. "My secretary told me——"

"That I'd reported an anti-State felony Class One?" the other supplied. "Well, he was quite right. I thought I'd better get straight through to you."

The general's face grew redder. "But a Class One means either murder or suicide, and . . ."

"This is suicide. Dr. Robt Jaksn the neuro-physicist, 992c, Avenue 7794, Third Level. I'm up there now with half a dozen men."

"I'll be with you inside fifteen minutes," snapped the general.

A fast turbocar took him to the northern area of the vast city that was NU Lundn, and with a minute and a half to spare he reached the office of Dr. Robt Jaksn.

Kristofr met him in the hallway. "Afternoon, sir," he said.

"Afternoon," the general grunted. "Now what is all this nonsense?"

"I'm afraid it isn't nonsense. This Dr. Jaksn has somehow managed to kill himself without being detected."

The general threw his coat on the nearest cushion and waved his arms. "But the whole thing's impossible, I tell you. The Detector is completely infallible, you know that as well as I do. However hard he'd tried to restrict the death-wish vibrations he couldn't have succeeded. Even if he'd been able to keep them down right up to a fraction of a second before he committed the act the Detector would have caught him and sent out a stun beam."

Kristofr shrugged. "Come in and see for yourself," he said.

The room they entered was the office normally occupied by the late doctor's secretary, and through an open door they could see the consulting

room that now contained the secretary, six policemen and, the general noticed, the inert form of a man stretched out on a foam couch.

The policemen snapped to attention as the general entered, while the secretary—a pale young woman with hair dyed a vivid shade of lime green—continued to whimper and dab at her eyes with a handkerchief. The general turned to her.

"What happened? You're the doctor's secretary, I take it?"

"Yes, sir. I—I was outside, in my office. Dr. Jaksn had told me he wanted to be left alone and not disturbed."

"What time did he tell you that?"

"At—at about 1300, when I came back from lunch."

"Did he have any callers?"

She nodded, her green hair bobbing. "Two—besides visor calls, of course. But I turned them away. When—when it came to my time for leaving I tried to call him on the visor but he didn't answer."

"Then what did you do?"

"I—I knocked on the door,

and then when he didn't answer that I tried to open the door. It was locked. I called out to him and he didn't answer, and then—then I began to get worried. I fetched the janitor and asked for his master key."

"And when you got in and saw the body you called the police, is that right?"

The girl nodded.

The general turned to Kristofr. "You checked on the janitor and the key?"

"I did. Apparently the man let her take the key. He didn't come in here at all."

General Lee moved over to the body on the foam couch. "How did he do—how did he die?" he asked.

Kristofr repressed a smile at the way in which his superior had avoided admitting that the man had, in fact, taken his own life. "From the looks of things he pumped himself full of GT.66. There was a hypodermic in his hand when we found him and a bottle labelled GT.66 on the table. Also the puncture mark in his arm. And this." He handed a slip of paper to

the general. "It was clutched in his other hand."

It was a suicide note. It said:

My reasons for taking my own life are my own and no one else's. For that reason I have refused to apply to the State for Uthanasia, knowing the number of forms I should have to fill in, the number of interviews I should have to be given. I have killed myself with a swift-acting poison known as GT.66 and I have avoided detection in this anti-State act by means that you will fail, I think, to discover.

"You have tested this for fingerprints?" the general asked, sharply.

Kristofr nodded. "None but his own. The same applies to the hypodermic and the bottle. And if you're thinking of murder, sir, you've got much the same problem on your hands: how would the Detector miss the vibrations of a potential murderer any more easily than those of a potential suicide?"

The general stared down at the plump, middle-aged man

on the foam couch; the man who was so very dead and who presented the Security Police with a problem the like of which had not been known for many decades.

"Have you contacted the Detector staff?"

"Not yet, sir. I thought it best to wait for you before doing so."

General Lee nodded. "Quite right. If there'd been any major breakdown there I'd have heard before now anyway. But if the detection beams are failing on a few waves only the staff might not have discovered the fact yet."

Kristofr grunted. "Shall I get through to them now?"

"In a minute." General Lee turned to the policemen. "This matter goes no further, you understand? A man died here of natural causes. No suicide. If one word of this leaks out you'll be demoted to Class E ManUlz." He pointed a lean finger at the secretary. "You, miss, will have to be given a psychoblok. Nothing to be frightened about. Couple of hours at Scotyard psycho-

surgery, that's all. Simply removes all details of the suicide from your mind and gives you memory patterns of a normal death. Go with that officer there. He'll notify your people and make sure that you get a new secretarial post right away. No, not yet. We'll need to question you further."

Kristofr pointed to the body. "What about him?"

The general nodded to the visor. "Tell the Yard coroner to come up for him. Don't go into details." He stared round the room. "Any chance of anyone getting in here apart from through the door?"

Kristofr shook his head. "We've been over the place thoroughly. Only one way in or out."

"Then the possibility of a murder disguised to look like suicide seems to revolve around whether this young lady here is telling the truth or not." He stared at her intently for a moment, then turned back to Kristofr. "You've got a psychoprobe on you?"

"Yes."

"Then take her into the other room and use it on her. Get information on all Jaksn's recent callers and activities, too." He wheeled on the other policemen. "You three check on the janitors and the automat scanners on all the doors. But don't give anything away that you don't have to. Find out if anything unusual has been observed here. Find out as much as you can about Jaksn. You others get onto Records and check on the man's past history and his private life."

On the foam couch the body of Dr. Robt Jaksn, neuro-physicist, with its sightless eyes gazing at the ceiling of the consulting room, lay very still, and cold, and dead, and quite unaware of the vast commotion it was causing.



"WELL," BARKED GENERAL Lee as Kristofr entered his office, "what have you got?"

"Statements from everybody likely to be of help, and reports from Records and the Detector staff." He sat down opposite the general and

opened the folder he was carrying, extracting numerous sheafs of paper. "I've put all the statements through the Correlator and the results are much as I expected."

"Let's have 'em, then," said General Lee. The Correlator, an electronic device, was employed in all police departments for the purpose of deducing logical probabilities from any amount of given data.

"Well, the psychoprobe on the secretary showed that she told the truth about not entering the room between 1300 and 1600 hours. It also showed that she did not leave the office during that period and admitted no one to the consulting room. Deduction, if result of psychoprobe correct: Jaksn took his own life since there was only one way into the room. Additional corroboration: two visitors only were recorded by the automatic scanners and seen by the janitors, both of whom left within minutes of their arrival, having been turned away by Jaksn's secretary. Deduction, if results of psychoprobe incorrect: someone

must have installed a psycho-blok and false memory pattern in the secretary to make her immune to our probe. The percentage probability of this latter is 19.2; percentage probability of the former is . . ."

"Never mind the details, I'll read the lot later. I want it brief," cut in the general.

Kristofr sighed and looked up. "Briefly, sir, we're in a hole as big as a Lunar crater. The Detector staff say there's nothing wrong with the Detector itself and that their recorded impressions of Dr. Jaksn's neurone waves are still intact—indicating that he's still alive. The coroner tells us that Dr. Jaksn injected himself with enough GT.66 to kill twenty men and has been very, very dead since approximately 13.30 hours this afternoon"

The general snorted and stood up. He walked the length of his office and stared out of the window.

In the ensuing silence Kristofr thought over the problem. *Why* should Jaksn have taken his own life? The excuse given in the note seemed feeble in the extreme.

Acceptance for Uthanasia did not involve very elaborate formalities provided that the candidate was proved to be genuinely self-destructive and beyond psychosurgical treatment for death-wish neuroses.

General Lee turned and stared across at his assistant. "What about Jaksn himself? What did you find out?"

"IntlectUl Class A, forty-three years of age. Educated at 73rd State Academy, then Oxfd and on to Central Lundn Research. Specialised in neurology and neuro-physics; did important work on the effects of space travel on the nervous system. Married five years ago to Class B IntlectUl Ena Mitchl, an artist. No children, since both have inferior genetic histories—four generations back—and are, therefore, grade C for mating requirements. I haven't yet told her about the suicide since—"

"I know, I know," said the general testily. "The law states that if a man commits a Class One felony against the State his blood relatives forfeit all claim to financial reccmpense of any sort, and

are demoted to Class E of whichever group they belong to. So if you tell Jaksn's wife that her husband took his own life the whole thing will become public, since she'll have to be penalised in the correct manner and through the correct channels."

"Exactly," Kristofr admitted.

"Go on about Jaksn."

"Not much more to tell. He's highly thought of in the scientific world, has numerous friends within the IntlectUl class. He's a member of numerous scientific organisations; has never been convicted of anti-State activities. The only two black marks on his record are the usual sort of things you find if you dig into the past of a respectable IntlectUl—drunk and incapable when he was nineteen and causing a breach of the peace at twenty-one—some sort of students' demonstration, I believe; nothing serious."

He turned to another sheaf of papers and went on: "Two things, however, seem worth more investigation. The first

is that Jaksn has a private laboratory in the same block as his office and has used it reasonably frequently over the last four years—since he moved in, in fact. But recently he's been in there much more frequently, working all evening and sometimes practically all night. This last week seems to have been a peak period for him, too. The janitor reported that a whole load of equipment was shipped out of there, under Jaksn's personal supervision, three days ago, and another load collected at 06.00 hours *this morning!*"

General Lee rubbed his chin. "Have you had a look at the place?" he demanded.

Kristofr nodded. "I was up there just now with a couple of men from the Yard laboratories. They told me most of the stuff in there was the kind you'd expect to find in the workroom of a neuro-physicist, but there were plenty of marks that showed that there'd been other gadgets in there, too. Presumably the ones that Jaksn had moved out."

"So?"

"So doesn't it seem probable that he was working on something that would immunise him from the beams of the Detector in order to get away with suicide?"

The general grunted. "I can't think that a man who couldn't be bothered to fill in the necessary forms for Uthanasia would spend all his time on such a gadget, but it's a possibility. Have you checked on the way the gear was moved out of the laboratory?"

Kristofr nodded. "I've put men onto that—also onto the firms that supplied apparatus to Jaksn. Nothing's turned up yet, though." He eased himself on the foam cushion and looked up at the general with a worried frown. "Sir, I was wondering something. It occurred to me that if Jaksn *was* working on some sort of shielding device that would protect a man from the Detector, we ought to give more time to finding out what's become of it than to why Jaksn used it for his own purposes. If it fell into the wrong hands . . ."

The general started, his

blue eyes brightening. "You mean you think the Heresy League might try to get hold of it?"

Kristofr spread out his hands. "It's a thought we shouldn't overlook, I feel. With the Detector to stem all outbreaks of mass violence our system has remained stable for the last half century, but if the Detector's beams *could* be made useless in some way, and if the Heretics discovered how this could be done, then we might easily have trouble on our hands."

General Lee frowned. "Those accursed Heretics! Why in the name of Saturn's rings should they want to buck against the system? Can't they understand that we've got a stable society and a stable economy for the first time since the world began? They fill themselves up with a lot of fool notions about liberty of the individual, read a lot of fool books that survived from pre-Germwar days and think they're heroic just because they try and pit themselves against the World State. Why do they do it?" He rounded on his assistant

and banged his fist down heavily on the top of the vast silicoid desk. "*Why?*"

Kristofr grinned. "If that isn't a rhetorical question I can give you an answer," he replied. "I've been studying up on the history of the Heresy League for the last year or so."

"Go ahead, then."

Kristofr folded his hands on his lap. "Well, they're loosely organised because they have to be—our Security men being as efficient as they are. The idea of the League, apparently, is to bring about some form of revolution. League members feel that our system of three main categories—Drectorz, IntlectUlz and MarUlz—is unfair; they feel that the efforts we make to destroy all evidence of the past are turning the race into slaves because—they say—people are growing to accept the system as it stands and are incapable of thinking in terms of progress, since their knowledge of the long struggles mankind made before the formation of the World State is so limited."

"What rubbish," snorted

General Lec. "What utter rubbish. Haven't they the sense to realise that, but for the formation of the World State and the subsequent exploration of the nearby planets, we'd have had war after war? Can't they see that, but for the formation of the World State, wars would have spread to the other planets through disagreements over colonization rights and so on? And what if the State policy *is* to keep pre-Germwar history from the people? It's given everyone a sense of security, hasn't it? Surely it's obvious that things are better now; everyone has a reasonable standard of living; everyone has the job for which he's best suited—wherever possible; everyone is looked after by the State, and for all of this the State simply expects obedience. Certainly there are rules and restrictions. Quite a number of them. But such things *have* to be there in order to keep the system running smoothly. As for the three grade classification, well, how else can you hope to fit people in without discord? By selective breeding you

create a people with the right qualities; by mating two people in the Drector grade who are psychologically compatible and whose Genetic Value indices agree, you produce a child which has a high probability line towards a Class A Drector position: a man capable of administration, reliability, ability to make decisions and take charge of others and so on. Since we know the necessary ratio of required Drectorz to required IntlectUlz we govern the number of Drectorz accordingly; if we didn't we'd have more Drectorz than we needed, and they'd have to be fitted into unsuitable jobs—which would have a detrimental effect on the smooth running of the system, and just as bad an effect on the individuals concerned. Exactly the same applies to IntlectUlz and ManUlz. It's not just the State that prospers by the present controlled breeding, but, in the long run, the individual as well. By checking heredity we discover whether an individual's ancestors had any diseases that might miss a few generations

and then crop up again. If such is the case we prohibit such people to breed. Inhuman? Hardly, when you consider the infrequency of hereditary disease today compared with fifty years ago."

Kristofr said nothing.

"Well? Don't you agree with what I've said?"

"Of course I do," the other admitted. "But then I'm a loyal employee of the State. The members of the Heresy League think quite differently, however. Their view is that the individual is more important than the State; they feel that the existence of a smooth-running society is not self-justificatory when the members of such a society are not free to direct their lives according to their own wishes."

"I suppose they think an E class ManUI knows more about what's good for him than do people who've spent their lives studying behaviour patterns, hereditary influences, psycho-genetics and so on, do they?"

Kristofr lit a cigarette. "I don't know whether they

think such a man would know better than others what he should do with his life, but certainly they think he has the right to *think* he knows better. The issue is not so much whether better results all round would come from an individual being able to decide his own future, but of the right and wrong of limiting such an individual's free will. The Heretics, you see, consider free-will to be more important than the smooth-running of the World State. They see things from an entirely different angle. Up to now their subversive activities have given us little cause for genuine concern, since the system has been so well established as to be virtually unshakable—thanks to the Detector. But if this man Jakson has found a way of blanketing neurone wave emanations . . ."

The general nodded slowly, thinking, his fingers tugging at the pockets of his tunic.

The Detector. The end product of over a century of concerted effort in cybernetics, neuronic vibration research and electronics; the end pro-

duct, too, of the efforts to prevent unlawful taking of human life.

One spoke of the Detector in the singular, but there were, of course, many of them. Each one governed a certain area of land and each performed the same function—namely, to prevent murder or suicide. General Lee was not a scientist, but there were few men living who did not know something of the way in which the Detector worked; such knowledge was too much a part of everyone's life.

Basically the Detectors were record departments of human neuronic vibrations; each one contained the impressions of the neuronic waves of each human in its particular area, together with neuronic vibration receivers that kept constantly in touch with such people. When an individual's vibrations increased in frequency beyond a certain point the Detector would go into action, sending out a cerebral stun wave keyed to the vibration pattern of the individual in question. The point at which this occurred was but a few milli-

seconds from the point at which the neuronic vibrations of the individual heightened to the level that told of maximum destructive tendencies that could only indicate potential assault, murder or suicide.

When the first Detectors had been set up the number of thwarted suicides had filled the mental homes, hospitals and prisons to such an extent that Uthanasia had been legalised for those who were considered too unfit to respond to psychosurgical treatment. Later, when the Detectors were in universal use, a permit was necessary if one wished to travel from one area to another, in order that the Detector in the next area might be supplied with duplicates of records and vibration receivers.

The Detectors had doubled the complications of travelling, but they had abolished murder, suicide and violent assault.

But if there was a method of avoiding the Detector's influence, and if the Heresy League should get hold of it . . .

Kristofr watched his superior closely but he was thinking, still, of the effects of fallible Detectors. He could picture the scenes: the assassinations of key officials; the riots; the undermining of confidence in the State. He was not so foolish as to imagine that the majority of people were in agreement with the way in which things were run, or that they were subservient for any reason other than general apathy and a certain amount of fear of retribution for any anti-State acts they might commit. There were plenty of malcontents on Terra and the other colonised worlds, but most were too strictly regimented to do more than grumble. Of course there were also those with more fiery natures who committed numerous anti-State offences, but up to the present such people had been reasonably easy to deal with, since actual violence against a person—let alone attempted murder—was prevented by the Detectors. But now...

The visor pip-pipped and the general answered it. "Lee here."

"Call for Over-Inspector Kristofr, sir."

Kristofr rose and crossed to the visor. "Who is it?"

"Under-Inspector DanyLz, sir. Shall I put him through?"

"Please. Ah, hullo DanyLz, what did you find?"

The plump face on the screen seemed creased up with anxiety. "I've had another talk with the Headtek at the Detector building, sir. He says that the records and receiving devices keyed to Jaksn's neuronic vibration frequency blacked out ten minutes ago."

Kristofr pulled at his upper lip, then said: "Well, surely that indicates that there *was* something wrong with the Detector. It should have done something or other early this afternoon, when Jaksn killed himself, and not left it until now."

"But, sir, the Headtek says that a direct black-out is unheard of so far as they are concerned. Natural death registers as a gradual fading, the neuronic vibrations continuing even after life has left a body, while with suicide the

cerebral stun beam operates automatically. He told me that the fact that the vibrations continued up until ten minutes ago means Jaksn did *not* kill himself early this afternoon."

"Then when *did* he kill himself?"

Under-Inspector DanyLz' eyebrows worked feverishly in his agitation. "The Headtek says he didn't kill himself at all. He's adamant. Says the corpse must be a fake or something. He says the Detector is still in perfect working order, though he admits that he doesn't understand why Jaksn's vibrations should have ended so suddenly. He says . . . Sir, what's the matter?"

"Nothing," said Kristofr, softly. "Thanks, DanyLz. Keep in touch with me." He switched off the visor and turned to General Lee.

The older man looked at him with a puzzled frown. "What's up?"

"Something I just thought of," said Kristofr. Then, without waiting for permission, he snapped the visor toggle. "Get me the coroner, quickly. Priority call."

"What *is* all this, Kristofr?" The general's amazement showed plainly on his face.

"Just a moment, sir, please. This may be vitally imp—Hullo, put me through to Aldrij, will you? Kristofr here. Yes, it's important."

The conversation with Aldrij lasted three minutes. At the end of it Kristofr snapped off the visor and turned to his superior. "You saw that, sir?"

"I saw him tell you that ten minutes ago they put Jaksn's body into the cremation chamber, if that's what you—here, wait a minute, didn't they say that the Detector recorded the vibration black-out ten minutes ago?"

"They did, but it's not what you're thinking, sir. We haven't cremated a living man. Jaksn was stone dead when I got to him at 16.30 hours this afternoon."

General Lee waved his hands aimlessly. "Then what *happened*, man? And what was the sense in getting them to rake the furnace?"

"I want all the ash put through the analyzer."

"But why?"

"Can you wait until their report comes through, please, sir? If my theory is wrong, of course, then they'll find nothing but the things they'd expect to find, but if it's right then there should be enough evidence in the ash to tell me what I want to know."

Ten minutes later the report came through from the coroner, who, acting on Kristofr's instructions, had put all the ash from the cremated body of the late Dr. Robt Jaksn under the electronically operated analyzer.

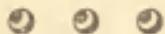
"But—but what on earth does it mean?" stammered General Lee, after the visor had been switched off. "A fused mass of metal found in the furnace . . . I just don't understand."

Kristofr smiled slightly. "It was what I had expected, sir," he announced, softly. "That fused mass of metal was the 'brain' of Robt Jaksn—only it *wasn't* his brain. The body was Jaksn's, yes, but the brain was a transplanted positronic machine geared to emit neuronic vibrations

corresponding with those of Jaksn, yet never exceeding the Detector's danger level. That's why the Detector never registered the suicide—if you can call it suicide when a man with a robot brain pumps himself—or *itself*—full of GT.66."

General Lee stared. "But what's happened to the . . ."

Kristofr nodded. "Quite, sir. That's what we've got to find out—if it's not too late already."



THE TWO MEN FACED EACH other, their tenseness emphasised by the complete silence of the consulting room.

"What—what do you mean?" the man called Lorens asked at last. "What do you mean 'if man is quite the right word'?"

Dr. Mikl AndrUz leaned back against his desk, smiling. The relief that took the place of tension softened his features, warmed the blueness of his eyes. "If I told you, you wouldn't believe me, Lorens," he said. "Not in your present condition, anyway. The best thing we can do is get your

memory back—and quickly." He raised his hand, stemming Lorens' questions. "No, wait a minute, don't ask me anything else. Just answer me this one question: do you or do you not trust me sufficiently to let me help you regain your memory?"

Lorens moved his shoulders in a tired shrug. "You're a doctor. If you think you can do it then I'm quite willing to let you." He stared hard at the other man.

AndrUz stood up, smiling. "That's the spirit. The whole thing won't take very long—in your case. I simply give you certain drugs and some electro-therapeutic treatment on the affected areas of your brain. My surgery adjoins this room. When you come out you'll remember who you are and why you are here, and—and you'll realise why it was so important for me to check up on you and establish your identity, since you yourself were unable to do so." He gestured towards the door that led into the surgery. "Shall we go?"

"Hullo. General Lee?"

"Well? Oh, it's you, Kristofr. Anything new?"

"I've tracked down the firms that supplied Jaksn with most of his apparatus. About twenty per cent. came from the Central Research Supplies—the normal sort of stuff that any neuro-physicist might be expected to use in research experiments."

"And the rest?"

"Very clever. He ordered from so many different firms that no one supplier could get any idea of exactly what sort of machine he was constructing; I mean he'd order component parts from, say, twenty different people, none of whom could guess, from the stuff he ordered, what machine he was building or what it would be used for."

"Well, do *you* know what he was building?"

"I think so. I've just been through his orders with a couple of men from our laboratory. Jaksn was working on a positronic robot brain—among other things."

"What do you mean, 'among other things'?"

"Just what I say. The other

things are more puzzling. Some of the stuff he was working with indicates that he was also onto something connected with synthetic humanoid manufacture. Obviously he knew that to construct positronic brains or to dabble in android manufacture was illegal—consequently he used umpteen different supply companies to get his material. No one supplier could ever get sufficiently suspicious of him to warrant contacting the authorities. Yes, Dr. Robt Jaksn was certainly a clever man."

"But what would he have been doing with android manufacture? I don't see the connection. Jaksn's body was definitely that of a human, surely, otherwise the GT. stuff wouldn't have taken effect."

"I know that."

"And another thing—if it was Jaksn's body that we found, then who inserted the artificial brain?"

"An accomplice, you're thinking? Quite. We're working on that now."

"Any leads?"

"We're checking everyone we can think of. The big

trouble is this business of keeping the suicide dark. What I really need is a long talk with Jaksn's widow and some of his more intimate friends."

"I was going to visor you about that just now."

"What do you mean?"

"I've been onto State Control. They've told me that our department is free to question everybody we want to question; they've given us permission to psychoprobe anyone and everyone and to put psychoblocks on them afterwards."

"Anyone and everyone?"

"From an E ManU to a StAcon Director. This thing is big. If I don't get it all sorted out I get down-graded."

"Ow! That's bad, sir."

"Bad bad, Kristofr; if I go under so do you, since you're the man in immediate charge of the case. So the thing to remember is that we're not going under. Sav?"

"Sav."

A pause.

"Sav sir."



He stretched himself out on the foam couch, stretched out

and let the null-grav cushions caress his head, his body, his limbs. It was like a super Buoyobath, he thought, remembering vaguely the *experience* of a Buoyobath without recalling where he had had one, or when.

The foam settled itself about him, holding him with softly luxurious fingers that moulded themselves to the contours of his flesh in the way that water might welcome the outlines of a human foot placed tentatively in a tide-line pool.

Somewhere behind him Dr. MIkL AndrUz was busy with some strange apparatus. He had seen the apparatus when he had entered the surgery, but it had meant nothing to him. Just a box-shaped thing with a tube stretching from it—a tube that ended in a cup-like metal shape. And there were cables and wires that led from the box to a bank of points and switches on the wall.

He lifted his left arm and his right arm and gazed at the small discs of glittering plastic with which the doctor had covered the tiny punctures made by the hypo.

"How long will it all take?" he asked, his voice seeming to come from outside his head, instead of inside. It was, he thought, like hearing an echo sounding down a long tunnel; an echo of words spoken hours before, yet which still reverberated on and on.

"Scarcely any time at all," came the reply, faintly, faintly.

"Will—will I feel anything?" A fainter echo.

"You'll feel a lot. Not *physical* feeling. Mental. You'll go through the things that led up to this visit, in your mind, but you'll go through them very, very quickly."

The voice was not a voice—though the meaning of the words was quite plain; it was not a voice but the booming of a gong ten million miles away. It was the whisper of leaves in a night wind; the kiss of small waves on a world of moonlit sand.

He closed his eyes, feeling as he did so the cold touch of metal about his head. That machine, he thought. That metal cap thing. That's what it is.

The tiredness seeped

through him like some strangely viscous liquid that threaded its way, with slow deliberation, throughout his entire being.

You'll go through the things that led up to this visit, in your mind, the echo repeated again and again. But you'll go through them very, very quickly.

Dr. MIkL Andi Uz turned this knob, clicked that switch, adjusted a certain dial . . . and waited.



She settled the three kisksules at the back of her tongue and downed them, together with the glass of spirit, in one gulp.

She was tall, plumpish and more than good-looking for her forty-four odd years. Yet now her eyes were strained and reddened, and her hands twitched and shivered as she replaced the glass in the Kleenall.

The news of her husband's death had come through on the visor from Centralmort some thirty minutes before, and she had in no wise recovered from the initial shock despite the fact that she had never felt more than a moder-

ate amount of affection for the man.

What did five years of married life really mean, she wondered. Companionship? Yes, but little more than that. There had never been any question of love; certainly no question of rearing a family. How could there be when one was told who one was going to marry, and when one was instructed, officially, as to whether one might or might not have children?

She tried to tell herself that hennervousness was due simply to the fact of her husband's death; tried to convince herself that shaking hand and throbbing head resulted from this sudden break in the smooth-running of her routine and in the loss of her "companion in life" Robt Jakson.

She did not convince herself.

There was something else there, at the base of her twitchings, her tremors, her nervousness; and that something was fear for her own safety.

It was not that her husband had ever shown himself to be

in revolt against the system—against (she hardly dared think the word)—the State. Far from it. He had always been so careful, so righteous, so incredibly pro-State in all his views. And that in itself had made her suspicious. *No one* could be so content with the system as it stood unless they were insane, or unless . . .

Unless they were carefully giving out the impression of being pro-State for a specific reason.

And then there were the long periods he spent away from home, working in his laboratory. She knew full well that he was a busy man, but recently he had apparently had more work to do in a week than most men had in a month. And then there was . . .

She shook her head violently in an attempt to drive away the haunting thoughts, the thoughts that kept leading her to think of her husband as something other than a State-respecting citizen, something more than a neuro-physicist and IntlectU1 Class A.

The tendril-fires of the three

kiksules she had taken threaded their way through her, giving her new life, new energy, banishing the fear-thoughts and hastening positive images to those mind-pockets where doubts and hesitations had previously held sway.

The murals. The murals for the GlazgO Psycho-Genetic Institute. She had to get the roughs finished before the end of the week, and she had barely started work on them.

She was halfway across the room, heading for her studio, when the voicelok on the hall door announced that she had a visitor.

"Who is it?" she asked, her voice high, quavering.

"A Mr. Kristofr, madam," the voicelok told her, relaying her visitor's words in its own metallic and un-musical tones. "An over-inspector from Scot-yard. He wishes to speak to you about Dr. Jaksn's death."

"Please open the door and ask Mr. Kristofr to come inside," said Dr. Jaksn's widow, her heart pounding.

The voicelok announced a formal greeting and admitted

Mr. Kristofr and two other Security officers.

"Mrs. Ena Jaksn?"

"That's right. What can I do for you?"

"My name is Kristofr. I'm an over-inspector from Scotyard. Security Police. I'd like to talk to you about your husband's death. These are two other men from Scotyard, my colleagues Hendrsen and Wilcox."

She inclined her head, stemming the shivers that threatened to run through her body and thus give away her nervousness. "Do please come in and sit down."

The three men followed her into the lounge and sank into the foam cushions she indicated.

Kristofr smiled a heartening, professional smile. "I'm terribly sorry to have to bother you at a time like this, Mrs. Jaksn, but I'm afraid your husband's death was not a normal one."

She stared at him, turning her head away from the window so that the light should not strike directly onto her face and thus show up the

dilation of her pupils due to the excessive dosage of kisksules; so that, in fact, her visitors should not think of her as anything but a normal bereaved widow. "What—what do you mean?"

"I mean that Dr. Jaksn did not die from natural causes. He took his own life."

"But . . ."

"I know. The Detector prevents such an event. No suicides have occurred in the last half century, and suicide, anyway, is an anti-State felony Class One. Yet despite all that, your husband killed himself, Mrs. Jaksn. He injected himself with a swift-acting and particularly virulent poison known as GT.66, and also managed to avoid the preventative beam of the Detector." He eased himself further into the gentle clasp of the foam cushion and regarded the nervous woman opposite him unwinkingly. "You know what happens to blood relatives of a suicide?"

She looked down. "Declassification and—and loss of financial benefit."

Kristofr nodded. "Exactly," he said. He paused a moment, letting the thought take its time in sinking in, while he himself thought over the urgent message he had received from the General just before setting out to visit Jaksn's widow: the message that had told him to use bribery before force, tact before bluntness, discretion before precipitousness. StAcon still wanted the whole thing kept dark and, as a consequence, had authorised the Security forces to use any and every means at their disposal to ensure that the darkness was such a complete and utter gloom that even the searching eye of the most intelligent observer not directly involved in the business might not pierce it.

Kristofr had laid his plans accordingly. He cared little whether General Lee kept or lost his position as head of Scotyard Security Police. He considered that the man's vigorous praise of the selective breeding system was a second-level—possibly even first-level—subconscious Ego-affirmation, since, despite the fact that the man himself

had been born of two Class A Drectorz, he was a genuine throwback: one of the unpredictables that were bound to crop up every so often. General Lee, Kristofr knew, was a man with a mentality of scarcely higher grade than a B ManUl, and quite incapable of coping even adequately with a major administrative position. But for his ability in the art of foisting hard work and responsibility onto his subordinates he would never have remained in office for so long.

No, it was not thoughtfulness for others that had prompted Kristofr to put all his energies into this particular case. It was the knowledge that, providing he solved the problems with which he was presented and satisfied StAcon as to his integrity and value to the State, he could jump-grade from Drector C to Drector A, and probably oust the general from his post as Head of Security at the same time.

It would be very pleasant, thought Kristofr, to be Class A and Head of Security. Jumpgrading didn't happen

often, he was well aware, but if he solved this case *completely* it *might* happen to him. State willing.

The two men he had brought with him were reasonably intelligent officers, but they were also tall, of stern appearance and of massive build. The strength behind the smile; the fist within the glove; the latent force of the State, ever ready to swing into action should politeness and consideration fail.

He himself, of course, was politeness and consideration.

"Mrs. Jaksn," he said softly, dropping his gaze. "I quite realise what a shock this must be for you. I expect you're quite well aware that there hasn't been a suicide, as I said, for more than fifty years. Nor a murder for that matter. A Class One anti-State felony, we thought, had become a thing of the past." He looked up suddenly, smiling to reassure her. "We want to try to keep it a thing of the past."

A person well-acquainted with Over-Inspector Kristofr might easily have been amazed—had they heard him

speaking now—at the mellowness and resonance of his voice, for it had a tonal quality normally quite lacking from his speech. And this was part of Kristofr's plan. An hour before he had found Mrs. Jaksn's personal ManUl—a woman named GrImz—and had had her psycho probed in order to find out as much as possible about the late doctor's widow. He had discovered more about her than—he was certain—would have been possible had he interviewed Jaksn himself. He knew the colours she liked, the scents, the activities, the type of people, the type of conversation. He learned which actors in the Sensory Houses stirred her most and which books she most frequently viewed on the auto-scanner while resting from her painting.

Twenty minutes after the completion of the psycho-probing and the final installation of a psychoblok in the GrImz woman's mind, Kristofr stepped out of the Scot-yard surgery—but it was a different Kristofr. It was a fuller-faced, darker-haired

Kristofr, this one. A man with a darker skin, and with features that had more than a slight resemblance to those of the well-known Sensory actor Van Klark. The resemblance was by no means complete, but, of course, it was not meant to be complete. And the Adjuster that rested snugly against the dorso-ventral membrane of his vocal cords—and thus altered their vibration frequency—gave his voice the distinction of being extremely similar to that of the same Van Klark.

She looked at him unsteadily. "What do you mean?"

He moved his shoulders slightly and leaned towards her. His suit was almost a duplicate of the one Van Klark had worn in his last Sensory. "I mean, my dear Mrs. Jaksn, that we hope you'll co-operate with us and tell us all we want to know. In that way we can stop the knowledge of your husband's—er—death from getting to the general public and also, of course, stop any resultant consequences from affecting your own life. There, now—"

again the smile, "—I've laid my cards on the table, as they used to say. I hope you'll be as frank with me as I've been with you."

State Sensories had told him that Van Klark's perfume used in his major Sensories was MaskAlin 90b. Director Filipz, who ran State Sensories, had sole charge of the blend and used it only for Van Klark in Van Klark Firstfeaturz. Kristofr had had to use all Scotyard Security's influence to get even as much as now wafted from the chintz collar of his jacket and from behind his ears. "Well?"

"I—I'll tell you whatever you want to know," she said.

"Fine," said Kristofr. It was going to be easier than he had thought. Already her eyes were phenomenally bright and he would have had to have been an E Class Manul not to have noticed the way her breathing quickened when he had leaned forward. He turned to his companions. "I'll talk to Mrs. Jaksn alone. Wait for me outside, will you?"

When they had left he

stretched out and took Dr. Robt Jaksn's widow by the hand. "I can't say how sorry I am that those two had to come with me. Security procedure, you know." He laughed. "Now then, if you'll just answer a few questions I'll try to make the whole thing as short as possible."

"Of course," said Ena Jaksn. There was something about this man that made her feel she was with a friend and not with a Security officer, being questioned about her husband's suicide. Yes, *that* was it: with a *friend*. A look of Van Klark about him. And such a kind voice—such a gentle manner. If she played fair with him he'd do the same with her and see that she lost nothing because of — of the death.

"Can you tell me the names and addresses of your husband's closest friends, please?"

She saw him pull the small recording box from his pocket, saw him hold out the microphone and activate its null-grav beam so that it remained suspended near to her face. "Well," she started,

"there's HarE Tolbt; he lives at 175d, Lane 41, First Level, here in Lundn. He's a specialist in neurology and worked with Robt at Central Lundn Research. Then there's Dr. JOnz, he was . . ."

He asked the questions; she answered them. The microspool within the recorder revolved and revolved and did not miss a word or single cough or solitary change in inflection.

Who were her husband's closest friends and where did they live and work? How long had he known them? How often did he see them, say in the course of a normal week? Had he been seeing any one more than the others just recently? Where did they meet? Did he ever bring them back here, to his apartment?

The more answers he received to his questions the more soundly Kristofr congratulated himself upon not relying on a psychoprobe. For a psychoprobe revealed facts; you asked questions of a person under a psychoprobe and you got factual answers but you got no vocal inflection in the answers that might

lead to something else; you got no blink of the eye or swift glance to one side that might indicate that the person being questioned had thought of something and then, at the last moment, decided not to go any further. With a psychoprobe you got objective and not subjective or intuitive answers, and Kristofr was accordingly very pleased with himself for having gone about things in the way he had. For he had realised that if Jaksn had been involved with the Heresy League in any way he would have either taken his wife completely into his confidence or else—and this was far more likely—excluded her altogether. And a woman excluded from her husband's inner life tends to want to know why she is being so excluded, and to make some investigations accordingly.

The Van Klark MaskAlin 90b appeared to work twice as well as a psychoprobe, Kristofr mused as he leaned forward yet again and clasped Mrs. Jaksn's small plump hand within his own. "You've been a great help to us, Mrs. . . . Well, since we've

really become such friends I'm sure you won't mind if I call you Ena."

She blinked. The voice was really *so* similar. "I—of course I don't mind. I'm glad to have been able to help."

He checked through the facts in his mind. Jaksn had made numerous journeys out of Lundn, their frequency increasing over the last few months. Jaksn's wife had once heard him give visor directions to a turbocar hire firm about a trip he intended to make to the south-west of the country, but had previously told his wife that he was going to Durum to attend a scientific meeting. She thought an old school friend of her husband's lived in the south-west, an old school friend who had also taken up neuro-physics and whose name was Dr. PETr MIkLsn—probably a fake name; check with Jaksn's Academy records for student of similar age leaving to specialise in neuro-physics. Then there was the fact of Jaksn's frequent nights away from home, when he had

said he was working at the laboratory—and not working alone, possibly, since the woman had mentioned an A Class ManUl that Jaksn had employed in his laboratory as an assistant; check on him, too. And above all there was the fact that Jaksn's wife had had a feeling of something impending for a couple of months or more. She had felt, Kristofr gathered, that she was being more and more shut out from her husband's life. The death was really the climax to a long period of tension that simply *had to have* a climax.

It was unfortunate that the woman had been unable to give him more specific information regarding Jaksn's friends, but it couldn't be helped. He had got enough leads to work on and he was practically certain that one or other of them would take him elsewhere than into the proverbial blind alley. As for Mrs. Ena Jaksn, well, she would be psychoblokt regarding their recent conversation, and her subsequent fate depended on further developments of the case. If he

discovered that no method had been devised for blocking the Detector's influence, then the suicide could be exposed as an *attempt* at an anti-State Class One felony, inasmuch as the State had been initially deceived into thinking that Jaksn had taken his own life. As a consequence of being related to the person involved in such a deception, Mrs. Jackson would be down-graded, etc., accordingly, and the State would have a scapegoat—what on Terra did the word mean?—to hold before the public eye and thus prove its own omniscience. But for the initiative and courage of General of Security Police R. N. Kristofr—late Over-Inspector Kristofr—the whole intricate nature of the crime might have gone unnoticed . . .

R. N. Kristofr believed in the State above everything, but R. N. Kristofr came a very good second in his thoughts.

He stood up. "You've been very helpful, Mrs. Jaksn," he said. "Now, if you wouldn't mind accompanying me . . . ?" He motioned towards the door.

"But—but you said . . ."

He took her arm and urged her gently from the foam cushion. "Just a few more formalities at the Yard. I'm extremely sorry. Police procedure, you know."

Before he left he told one of his assistants to fit a spool in the voicelok that would inform all callers that Mrs. Robt Jaksn would be away from her apartment for some weeks on a vacation. That she would be spending it in the Women's State Prison, awaiting the State's pleasure until the case was concluded, he thought it wisest to omit from the record.

The fragrance of MaskAlin 90b lingered in the room long after visitors and tenant had departed.



You'll go through the things that led up to this visit. Very, very quickly. Go. Through. Things. Visit. Quickly. Go. Through . . .

The words were not words; and now they were not echoes, even. Each was simply a drum beat of strange and memory-stirring force that

pulsed about him like the beating of some cosmic heart.

And he himself was no longer possessed of identity, was no more than an eye that floated in darkness; an eye that drifted on aimless currents that ebbed and eddied through deep glooms and which, at last, gently and persuasively, drew him down to where dim lights gave out a pallid radiance to illuminate innumerable scenes that clicked their effortless way back into the bleak emptiness of his mind, from which—or so it seemed to him afterwards—they could never have been absent.

Go. Through. Things. Visit.
The drum beat.

The scene:

The big boy twisted his arm savagely and made him violently aware of pain—and of more than pain; of his own inferior size and strength. He was nine years old. The other boy was ten. They were in a shelter that stood at the edge of the Academy playground, and it was a cold winter afternoon.

The bigger boy exerted

more pressure. "Go on," he whispered hoarsely. "Admit that you hate the State. Say: 'I hate the State'."

He groaned as the pain increased. Then: "I—I hate the State."

The other slackened his grip. "That's better," he grunted. "Now promise you won't tell anyone that I made you say it." The grip tightened once again.

"Ow! I—I promise."

"Say: 'By God I promise'."

He shuddered. If any of his tutors should hear him! "By—by God I promise."

"That's better. I knew you'd think the same way as me. When I grow up I'm going to start a revolution."

He felt his arm suddenly released and he stretched it tentatively down to his side. It ached, but that was all. "Are you really?" he asked. There was a certain amount of awe in his tone.

"By God I am," said the big boy. "I'm going to be a *free man!* And listen—if I ever whisper 'I.H.T.S.' to you, then you're to whisper

the same back to me. Understand?"

"I.H.T.S.?" he asked, puzzled

"I Hate the State, of course. *Silly!*"

Go. Through. Things. Quickly. I. Hate. The. State. Go. Through . . . The drum beat.

And another scene:

He was in his room in one of the great Dormblox that lay behind the Central Research Institute. He was twenty-one years of age and had been studying at Central for just over seventeen months.

The blue light above his door blinked suddenly and the buzzer buzzed its toneless announcements at the silent room.

He pushed the button of his autoscanner and the screen that had been showing him page 167 of Fclsingr's "Typical Psycho-Neuroses of Rocketship Crews" went blank.

Who on Terra could be buzzing him at this hour? He went to the door of his

chamber and peered out. Nobody there.

But of course! The caller would not be admitted by the automats at this time of night. With a sigh he shut the door behind him. Better see who it was. Might be important. More likely, though, that someone had pressed the wrong stud, since he himself hardly ever had any visitors. Certainly not late at night.

He didn't recognise the young man at first. This was partly because the visitor's shape was thrown up in silhouette against the street light on the other side of the lane and partly because the fibreglass doors gave his figure a slightly distorted appearance.

He pressed the door control to "open" and said: "Who is it? Are you sure you've got the right number?"

The figure moved nearer. "Well, well. You've put on a lot of weight since I saw you last."

He gaped. It *couldn't* be... But it was. He managed a grin. "Beef," he said, remembering the other's nick-

name instantly. "What on Terra are you doing here at this hour?"

The other's words were swift and softly spoken; his eyes flicked up and down the street and there was a nervousness, an excited tension, in his speech that communicated itself to the young student in a matter of seconds. "Listen. I need help. If you can't give it then say so as soon as possible and I'll go. Remember 'I.H.T.S.'?"

The student swallowed. Strangely enough he *did* remember I.H.T.S. Or was it strange, really? The basic thought behind those initial letters had been in his mind many times during the years since he had left the Academy. But it had always been simply a *thought*; a thing abstract and vague, and capable of being kept hidden and secret within himself. He had never had occasion to admit to it openly, before another. Never—until now.

"What do you want? Why have you come here?"

"I.H.T.S.," said the visitor once more.

The student stood back. "I.H.T.S.," he said in a whisper. "Come up to my room—we can talk there."

They did not speak again until they were safely inside the room with the door locked behind them. Then the visitor eased his collar and slumped onto a couch. "Sorry," he murmured. "You were my last resort."

"What happened?"

"Heresy meeting. The Security got there though, and we all only just got away in time. We had turbocars stationed at various points in order to make our getaways in a hurry if it should prove necessary, but I ran into a blind alley by mistake and had to hide from the Security men. As a consequence I missed the turbocar that was waiting for me."

The student's eyes were very wide and they flicked, every now and again, from the newcomer to the door of the room and back again. If someone had seen him at the door, downstairs . . . He swallowed. "How—how did you know where I was staying?" he asked at length.

His visitor smiled tiredly. "We have lists of sympathisers—and potential sympathisers," he said softly. "Unfortunately it was a long way to the nearest man whom I *knew* would help me and it seemed more likely that I'd be caught trying to get there than if I took a chance on finding you here and getting you to let me in. And after all—I did give you the chance to turn me away, you know."

The student nodded. "And the fact that I didn't turn you away—what does that prove?"

"You know the answer to that better than I do," his visitor told him.

It was true. He did know the answer. It meant that he had taken the first step in converting a hidden thought into a positive action—possibly a whole series of positive actions. The idea made cold tremors play about his spine. Before, there had always been the comforting thought that "one man could do nothing against an entire way of life." Now, it appeared, it was not a case of "one man" at all. And if there was a Heresy

League, if it existed in fact as well as in rumour, then that, surely, was where his sympathies lay . . .

Wait, cautioned the small voice within him. Do nothing stupid. Don't let crazy idealism get the better of you. You're on the way to getting a particularly brilliant degree and you don't want to ruin your chances now. Just because you knew this man when he was a boy at school with you is no reason to get yourself in the bad books of Security. Have a little sense, can't you?

The visitor looked him straight in the eyes. "You don't know what to do, do you?" he asked.

The student shook his head wordlessly. Then he said: "No. Not altogether. But I'm quite willing to keep you here until morning if that will be any help."

"I'd be more than grateful if you could." He stretched out on the couch, yawning. "If you decide you don't want to have anything to do with me just say so and I'll go."

"No, no. Please stay." There was a pause. Then the student went on in a softer voice—a hesitant voice. "Tell me, Beef," he said, "just what is the Heresy League, and—and how do I join?"

*Go. Through. Things. Visit.
I. Hate. The. State.*

*More and more drum beats;
more and more scenes building
up out of the pale patches in
the darkness and fitting them-
selves into place in the swiftly-
filling chasm that was the
memory of he who lay uncon-
scious on the foam cushion
couch . . .*

It had started with that midnight visit. That had been the point at which the vague thoughts and ideals of adolescence and early manhood were given definite form and were shown to be similar to those of others who were equally antagonistic to the State. The catalyst that brought about this reaction was the student's old school friend and it was he, too, who explained the intentions, methods and organisation of the Heretics.

No, it was not possible for the student to become a member immediately. First he would have to be tested. He would be set a certain task that would involve him in danger: he would be asked to commit an anti-State felony Class Three. Probably this would take the form of a theft of some kind.

It did involve a theft. It also involved dishonesty, ruthlessness and considerable danger, but the student went through with it and, as a result of his success, was admitted to the Heresy League.

For nine years he met no other member of the League save for his school friend, for after the frequent disturbances at undercover meetings, the League decided to abandon them altogether and let each member know as little about the movement, and about other members, as was possible in order to avoid discovery. But from his school friend the student learned how important it was that he should continue with his work in neuro-physics. He learned of many other things concerning the League, besides: of the

way in which each member of ManUl, IntlectUl and Drector Class sought to progress to Grade A level; of the dual purpose of the League itself; of the way in which the State Academies taught a twisted and distorted version of pre-Germwar history in order that only the bad things of the period should be remembered by new generations of World State citizens, so that they might always be grateful and dutiful towards the mighty Father-figure of the State that had rescued the world from primitive and impractical forms of government.

After ten years of membership of the League had elapsed he met two more of its members. But it was his school friend, the man he still called by his nick-name of "Beef," who continued to keep him informed of the growth of the Heretic movement and of its constantly re-doubled efforts at keeping itself secret as year succeeded year.

His own part in the activities of the League grew in importance, also, as his knowledge increased and as his position as a scientist im-

proved. As a specialist in his own field, and no mean brain in several others, he was of great value to the State and consequently had to work particularly hard. As a League member, though, he was required to submit all details of his work to the League, while in the event of his making any original discoveries of his own he had instructions to ensure that the League got hold of them at least six months before the State knew anything about them.

When the State authorities told him that, as a prominent public figure and a Class A IntlectUI, he would be required to marry a certain Ena Mitchl, he was somewhat aghast. But the League informed him that if he objected the State Security men would doubtless want to know his reasons for so doing, and might subject him to too careful an investigation—which would be, or at least *could* be—risky in the extreme. As a consequence he allowed himself to become a husband.

Had he not been a League member he might have be-

come more than attached to the pretty and vivacious artist; but the League had a motto that went: "When the League has won its fight, *then* the individual can win his." So far as he was concerned this meant that he had to put his League work before everything else, especially since he had realised how important he was to the success of the second part of the dual plan.

Four years later he was sent to Venus with a research team for work that lasted nearly five months, and it was when he returned to Earth, at the re-entry medical check at NU Lundn Spaceport, that he learned that of all the members of the team he was the only one to have contracted any of the more deadly diseases to which Earthmen working on Venus were so very subject.

He had, he was told gently, about six months to live. Possibly slightly longer. The disease was one for which there was, so far, no known cure. He didn't tell his wife.

And so it went on. The drum beats and the scenes. The darkness and the brilliance

alternating with greater and greater speed as the being that was no more than an eye swam through them on strange tides and weirder eddies, swam past them and swam past them on and on, its visions—as each one was registered—juggling their way into position one with the other to thus build up anew that phantasmagorical collection of vari-level images that was the substance of memory for one certain figure that lay without motion upon a certain couch . . .



THE KRISTOFR THAT SAT AT the desk was a different Kristofr to the one that had interviewed Dr. Robt Jaksn's widow. Gone were the delicate synthiskin disguises that had so effectively altered his features. Gone, too, were the vivid suit and the aroma of MaskAlin 90b.

As the summer evening light faded to a certain minimum of brilliance with the setting sun the tubelights buzzed and flickered on all round the office.

He glanced up from his work. Late, he thought. So

late already. Perhaps *too* late!

He looked down again at his desk. Strewn all over it were reports from numerous Security officers on matters connected with the Jaksn case that he had ordered them to check. He had just completed his own deductions from the mass of statements and facts, and he needed now to check these with the Analyzer's findings. If the two agreed then he could be more or less certain of cracking the case with sufficient success to warrant jumpgrading, even if he did have to go over the finer points later.

General of Security Police, he muscd, would be a very pleasant title.

It took him ten minutes to correlate the Analyzer's deductions, when they arrived, with those he had made himself. The two agreed in all but minor details, as he had suspected would be the case. The moment his comparisons were completed he snapped on his inter-departmental visor and ordered five of his men to leave their routine jobs and assemble outside the building. He then contacted the Roof-

park supervisor and ordered four turbocars and a fast flycar to be sent down immediately. He had just finished this conversation when the light blinked on and off furiously and the screen glowed with orange letters that spelt out PRIORITY CALL.

He snapped on with savage impatience. "I can't take any calls now, priority or not. I'm on a case that . . . Oh, it's you, sir."

The General's face was bleakly uncompromising upon the screen. "Yes, Kristofr, it is. And I'd be glad if you'd remember that *I* happen to be Head of Security Police here, at the present time, and that when I issue a priority call I expect you to accept it in the proper manner."

Kristofr fought down the impulse to swear and started a muttered apology with which the General did not permit him to continue.

"Also, Over-Inspector Kristofr, I would be glad if you would refer to me, in future, before you take over *entirely* on a Class One anti-State felony case. You seem to

forget that *I* am officially responsible for the solving of the Jaksn affair, and not you." The face on the screen frowned at Kristofr's angry and amazed expression. "I'm talking about the Analyzer deductions, man," snapped General Lee by way of explanation. "I want to go through them with you before you take the slightest of further actions. I will *not* have people taking the law into their own hands in matters about which I should be consulted. Report to my office immediately, and bring the Analyzer reports with you. Do you understand?"

Kristofr's nails bit into the palms of his hands. "Yes, sir," he said, quietly. "Right away, sir." He clicked the toggle and spent the next minute screaming abuse at the blank screen. Then, pulling himself together, he grabbed up the various reports and stormed out.

By the time he reached the general's office he had his temper under control.

The general, too, was calmer. He looked up in a

somewhat apologetic fashion as his assistant entered. "Sorry I blew up on the visor just now," he said, "but we can't have unorthodox procedure in a case like this. If there's a need for swift action, then give me the chief facts quickly and I'll authorise you to go ahead if it seems fit to do so."

Kristofr sat down, lining up the "chief facts" in his mind. "Well, sir, first there's Mrs. Jaksn's statements. You heard the recording?"

"I did."

"And I expect you remember that Jaksn was supposed to have had a ManUl assistant? Good. Well, our check proved that the ManUl wasn't a ManUl at all, but an A Class IntlectUl—an expert on positronic robotics and and oid manufacture, and a brilliant surgeon besides."

"But—but how in the name of Saturn's rings could he take the place of a ManUl?"

"There are members of the Heresy League everywhere, sir. Somehow they managed to deceive the authorities sufficiently to enable this man to pass himself off as a

ManUl when he visited Jaksn's laboratory."

"What else?"

Kristofr fidgeted on the foamy softness of the null-grav cushion. Soon it might be too late. Soon they might simply be left with a handful of minor members of the Heretics who would probably know little or nothing about the *major* issue, instead of catching the really important prize. If only the old fool would let him get busy, instead of keeping him here in this S.A-damned building!

"What *else*?" repeated General Lee. "I thought you were anxious to be off?"

Kristofr clutched the sheaf of papers tightly in his hand. The veins on his forehead rippled into prominence with the effort of keeping his temper as he continued speaking...

I. Hate. The. State. Go. Through. Quickly. The drum beats and the scenes. The darkness and the light. The crowding succession of brilliant images seen and recorded, seen and recorded . . .

The two men sat on the

bench in the wind-swept park. They chose a different park for each meeting—it was safer that way.

The man who was nicknamed "Beef" stared at his companion. "Six months," he breathed. "By God, old man, I'm sorry."

"I know what you're thinking, Beef. Oh, I know you like me and everything, but you're not really thinking of that, are you? Don't bother to answer; I can see you're not. What was the motto, now? When the League has won its fight, *then* the individual can win his."

"Don't talk like that," said the other man.

"Oh, it's all right, Beef. You won't hurt my feelings. In fact, to tell you the truth, I more or less think the same way as you, now, having been in the League for so long. Idealism is catching, you know." He paused a moment, choosing his words carefully. Then he went on: "You're thinking about the ship, aren't you? You're thinking about the colony on Phobos?"

The other man nodded.

Yes, the colony on Phobos, thought the man who had only six months to live. The colony that formed the heart of the second section of the League's dual plan. It had been built up under the very eyes of the World State, for to all intents and purposes it was composed of a normal group of colonists content to face the disadvantages of living in air-bubble towns, content to work very hard indeed for small recompense, and content to live on a tiny satellite of Mars where contact with Terra was cut to a bare minimum.

In reality, by far the majority of the colonists were Heretics who had been secretly aided by the League bosses in obtaining their emigration permits, health permits and so on. The colony had been started forty years before, and throughout the succeeding years the process of getting non-Heretics *out* of the Satellite and members of the League *in* had improved from its original hit-and-miss status to that of an effective and highly-organised system. And the colonists were there

for a purpose. For it was on Phobos, in workshops and machine plants, apparently functioning according to plans laid down by the World State, that the first star ship was being constructed.

The State was too busy ensuring the subservience to itself of all in the Solar System to worry about getting to the stars, but the League had no such pre-occupations. It knew that the revolution—when it came—might not be a total success; might not be a success at all, in fact. But it wanted to make certain, if failure *should* result, that some sections of humanity could get away to a fresh start elsewhere. For that reason the star ship was being built. And for that reason . . .

"It's not me, as a person, that's important, is it?" he asked. "It's my brain you want. My knowledge. You know you've got no one else in the League with my knowledge of space flight effects on the nervous system."

"I'm in the same line as you are," grunted the other

man, his broad shoulders sagging. "But I can't touch you. No one can, as you just said. And it isn't just that—you've got the sort of inventive brain we want. Think of the things you've given us—and only one of them had to get into State hands in the end."

It was true. He'd been more than useful to the League. His last invention alone—the Nullifier, as it had been termed—was the best weapon they had against the State in that it protected the man who carried it from the effects of the Detectors. They'd need him on that star ship, right enough. There would be new medical problems to face on a voyage to the stars, and he was the man to face and deal with such problems. He made his decision. "Listen, Beef."

"Well?"

"The body I've got is going to crack up on me inside six months, but it's not my body the League's interested in; it's my mind. Right? Good. Then why not get a new body for the mind?"

"What!"

"Androids are built up synthetically as facsimiles of human beings, aren't they? They're not like robots. No, of course they're not. The chief physical difference between an android and a human is that an android's brain is only a slight advance on a humanoid robot. Isn't that correct? Well then, suppose a human brain could be put into the body of an android. Yes, a transplantation of a brain, man; of course that's what I mean. I've been reading up on androids since—well, since that medical—and so far as I can see such a thing should be possible. Whose brain? Why, *mine*, of course!"

That was how it had started.

From then on it had been hard work. The League commended him on his selflessness and then got its minions moving without further ado. An android was brought from one of the Outer Planets—where State regulations kept them for fear that artificial humans and the genuine ar-

ticle would not mix—and was smuggled into NU Lundn. Then a Heretic surgeon began to lead a double life, becoming, surprisingly enough, an A Class ManUI on certain days of each week, who was employed in the laboratory of a certain neuro-physicist. A positronic brain was constructed in such a way that facsimiles of the neuro-physicist's neuronic vibrations would be emitted from it when the time came.

The plan was this: on a certain evening the Heretic "surgeon-ManUI" would perform the double operation. He would transfer the human brain into the cranium of the android and put the positronic brain into that of the human. By the following morning both operations would be finished. The robot brain would be keyed to the human body's motor nerves to a superficial extent only, but would activate vocal chords and facial contractions, etc.

In the early hours of the following morning the "ManUI" would carry the robot-brained human from the laboratory to the office,

settle him at his desk and then leave. The human-brained android, meanwhile, with a Nullifier on its person, would also leave, though by another exit. It would then take a flycar and head for a certain town and a certain man, carrying the identity of a League member who was, however, quite above suspicion so far as Security men were concerned, and carrying forged Detector Area clearance visas.

When the secretary arrived she would be told that her employer had worked through the night in his laboratory and was already in. The janitor would inform her of this. When she reached the office she would see a life-like figure sitting at her employer's desk, busy with papers. A voice that she would never guess to be a record emitted from a positronic brain, would tell her that she was to get on with her own work and not disturb him. He did not want to speak to anyone or to see any callers. This would not surprise her, as her employer frequently told her this at the

start of the day. When she returned from her lunch the door would be open and she would see the broad back, the bent head and the packet of sandwiches. She would be given the same instructions as before. Do not disturb. She would say: "Yes, sir," quite meekly, as she always did, and she would shut the door without knowing that a time lock had been fixed to the catch. Then, when it came time for her to leave she would knock, expecting the customary: "Oh, is it time already? All right, you'd better go. I'll be working late." But there would be silence. She would worry. She would call the janitor and he would use his master key. And they would be bound to call the police when they saw the body and the hypodermic syringe.

A complicated plan, but one that would do two things: ensure the longevity of a valuable brain and—by causing a suicide in a society in which suicide was impossible—sow the seeds of fear in the minds of the State authorities; fear that the Detector was no longer omnipotent—and the

subsequent and more terrible fear that their own lives could now be endangered.

A fine plan, only—

Only the flycar in which the human-brained android fled from NU Lundn crashed, and the shock of the crash scattered the multiple image-patterns of memory that resided in that very valuable brain.

The scenes sped past in white blurrings, growing faster and faster in their eternal procession. Then the eye became aware that it was a part of something else. A face. A head. And the head was joined to a neck and the neck to . . .

The drum beats faded to whispers and to empty silences. The darkness and brilliance merged.

The ceiling was a pale blur slowly coming into focus. A head was hugely dark above him. It split itself open and teeth showed. A voice spoke. "How is it?"

With the voice came the

last fragment of the puzzle to fit itself into its appointed position. "It's fine, Beef," said the android, slowly.

"We've got to get you away, old man. And quickly."

"Is—is everything arranged?"

"There's a rocket waiting not forty miles from here. Don't forget: you're Porl Lorens, now, until you get to Phobos. Once you get there you'll be all right. The pilot knows where to take you, and who to contact there. Better get dressed now, and make it as fast as you can." He took the strip of shirt cuff from his pocket and handed it over. "Wonderful the way that Nullifier can be hidden," he murmured. "You'd better keep it on you from now on."

"Porl Lorens" stood up, gazing at the disguised Nullifier. "You didn't switch it off, did you?" he asked suddenly.

"Of course I didn't. I just thought that since its field

would encompass at least twice the area of this room I might as well keep charge of it until you came to."

When Lorens had dressed himself once more the two stood for a moment looking at each other—the man and the almost-man.

"You're not coming with me, are you?"

Andruz shook his head. "I can do more good here on Terra. We'll have just as great a task here as you will on Phobos. I've made the final arrangements for your journey. Made them by visor while you were under the therapy. At the door of this building a man will take you to a turbocar. He'll drive you to the rocket. Now get on your way—Porl. And remember—I.H.T.S."

"I.H.T.S.," replied the almost-man.



". . . so there you are," finished Over-Inspector Kristofr, waving his arms. "Jaksn

was working on a positronic brain; this pseudo-ManUl was a surgeon and an expert on androids and robotics; the secretary now admits that she never saw Jaksn actually *moving about* throughout the entire course of the day; the janitor says that crates of machinery were shifted out of the laboratory that morning, and that this ManUl man also left early. Then there's the other man who left with Jaksn's pass-key, yet registered with the autoscanner as a man called Lorens about whom we've gathered a pile of evidence as high as a Detector building to prove that he was in GlazgO at the time, and is still there."

General Lee nodded. "Then there's this business of Jaksn's old school friend . . ." he murmured.

"Exactly. When we checked Detector Area crossings into west country regions for this evening we found that this man calling himself Porl

Lorens had checked a grip in at NU Solsbry Multiservis, and that it had been sent on, express delivery, to a Dr. MIkL AndrUz. Now there was a MIkL AndrUz at Jaksn's Academy." He waved the papers in the air. "Don't you see, sir, the whole thing adds up. We've *got* to stop him getting away. If he's all that important to the Heresy League, then he's *more* important to the State. We *must* stop him and find out why they want him!"

The general leaned back on his foam cushion. A brainy man, that Kristofr, he thought. Quick, intelligent and intuitive. Apart from a few details he'd solved the whole thing. Yes, it had been a sensible move he'd made when he'd handed over the whole affair, so to speak, to this very bright Over-Inspector. It had resulted in only the two of them knowing everything about it. There was the Analyzer, of course, but it wouldn't take him long

to extract the necessary record spools and destroy them. A few psychoblocks would be needed for some of the lesser officers, too, but that again was a comparatively easy matter. And, of course, he would have to invent some tidy ending to the case, eventually, one that would officially satisfy the StAcon, yet which would also give everyone cause to distrust the infallibility of the Detectors, and so on.

"Now, sir, will you give me permission to carry on?" urged Kristofr, leaning forward.

The general pulled a small metal ovoid from his right-hand pocket, while in his left-hand pocket he gripped and activated the tiny Nullifier. Ironical that both devices should have been invented by Jaksn, he thought, as he pressed the catch on the ovoid, confident in the knowledge that the Nullifier's field would blanket all his neuronic

vibrations that rose above the safety level.

Over-Inspector Kristofr slumped forward without a sound.

They'd call it heart failure, naturally, since that was exactly what it was. League members had often used the ovoids in conjunction with Nullifiers to further their plans. Yes, certainly Jaksn's brain was an object of great value to the League. And now it was safe. Probably on the way to Phobos by now.

Momentarily, just before

pressing the buzzer that would summon his assistants, General Lee stared out of his window at the late evening sky, searching the few visible stars for the red eye of Mars. He didn't see it. But he knew that it was there. Mars. Phobos. The star ship. And an ideal.

"Ah, well," sighed the general. "Come the revolution . . ."

He pressed the buzzer and started shouting at the same moment.

THE BIG HOP

is the title of our lead story next month. This is the first instalment of a two-part serial by J. T. McIntosh, author of *World out of Mind*, *One in Three Hundred*, *Born Leader*, etc. Supporting short stories are by Brian Aldiss, John Ashcroft and John Kippax. Non-fiction includes another article by Professor A. M. Low, information on the guided bomb by Kenneth Gatland and a host of other interesting, illustrated pieces.

AUTHENTIC — A Monthly Must

Transport of Tomorrow*

CIVILISATION depends not only upon possessing the means to make things, but also the means to move them. The history of civilisation might, indeed, be described as the history of transport. This will be even more true tomorrow, although the present century has already seen advances in transport that equal all the progress made in every preceding century.

The exchange of goods between countries has been revolutionised, and transport has made possible the existence of industrial Britain; all our skill and enterprise in industry would have been wasted if ships, aeroplanes, trains and motor vehicles did not bring to us and distribute vast quantities of food. The large manufacturing centres would cease to have life if transport did not allow the daily migration of millions from their homes to

factories, mines and offices. The future of transport is of especial interest to Britain. What is it likely to be?

by
Professor
A. M. LOW
D.Sc., Ph.D.

LAND

The future of land transport is virtually the future of roads. Roads are still handicapped by the dimensional limitations and mental "climate" of the horse-drawn vehicle. A far-seeing nation might have decided,

when the motor car made its appearance, to leave the horse vehicle roads to horses and build motor roads anew, as it built rail-roads; the idea of running railways alongside the existing coach roads was rightly never considered.

Safe and efficient road transport is largely a matter of constructing roads designed for this purpose and of realising that as many of our present roads were primarily designed for traffic that moved at

* From "It's Bound to happen" (Burke).

4 m.p.h. they are basically incapable of meeting modern conditions.

Pedestrians, horse vehicles and bicycles may be barred from the trunk roads of the future. The flow of traffic and elimination of the overtaking which is responsible for so many accidents will perhaps be insured by dividing the roads into lanes marked 30 m.p.h., 50 m.p.h., 60 m.p.h., with these speeds not only the maximum in the lanes, but also the approximate minimum. Crossings will all be "over or under." The motor car will be regarded as a potentially dangerous vehicle, like the locomotive or aeroplane, and the idea of pedestrians walking across a traffic route will be compared with the straying of jay walkers on the railway or on the runways of aerodromes.

The motor car itself will continue to develop very quickly, for it is far from efficient. It may not be long before the crudity of a mechanical gearbox is abolished. Introduction of the turbine instead of the reciprocating engine will also make for much smoother and more silent running.

During the next few decades

there are unlikely to be many very revolutionary changes in cars; rather a steady process of evolution aimed at greater speed efficiency and comfort, until the common car of 1990 will be as different from the models of today as our own are from those of 1920. Comfort is an increasingly important part of efficiency, so is convenience, and we may expect to see telephones on both cars and trains taken as a matter of course. Inductive pick-up for main roads, flood-lighting, cars with small engines carried amidships and true independent springing are all possibilities of the future.

RAIL

It is unlikely that there will be any large scale railway construction in industrialised areas, but in countries which are being developed, such as Africa and China, there must be many thousands of miles of railway track to be laid for heavy goods. The next fifty years may see railway construction on a considerable scale in Africa and Asia.

In most countries the tendency will be towards complete electrification for routes on which there is heavy traffic,

with the advantages of service frequency, cleanliness and simplicity in operation. For goods traffic and long distance services there will be the development of diesel-electric and turbine locomotives of far greater power. It does not seem likely that there will be a general increase in speeds, which are limited as much by the permanent way as by the locomotives. Long distance passenger traffic may eventually be completely suspended by competition from the air, but so long as the movement of coal, minerals and heavy goods of all kinds remains necessary, it is likely that railways will continue to operate upon present-day principles, the most notable changes being in the "cleaning-up" of design, greater efficiency in locomotives and greater comfort in passenger coaches.

SEA

In the immediate future the notable development at sea is likely to be the application of gas turbines to marine work with the advantages of space saving and vibrationless running which apply to the steam turbine. Instead of direct reaction, the high speed tur-

bine is geared down to the propellers and the problems which arise are largely mechanical—15,000 revolutions a minute is almost slow for the jet turbine, and to reduce this to a speed suitable for a ship's propeller demands the use of very specialised reduction gears. The problem of the turbine itself was very much that of finding alloys to withstand enormous stresses at high temperatures. These difficulties have been overcome in the main, and very soon we may expect 40-knot passenger liners to be driven by gas turbines.

The tendency may be towards smaller liners and speeds will call for totally enclosed decks with air conditioned ventilation. Even the newest ships seem to bristle with "bits and pieces" like a 1910 motor car. All these projections will be eliminated to lower air resistance, which becomes so important at the higher speeds. A ship travelling at 40 m.p.h. into a 30 m.p.h. headwind uses a great deal of fuel to overcome air resistance alone. Ships of the aquaplane type are a distant possibility.

AIR

The reciprocating internal combustion engine which has served heavier than air flying since its beginning is now on its way out and within fifty years of its large-scale application to aviation it may be the exception rather than the rule. It has certain advantages for light planes which may result in its retention for a period, but the commercial and military aircraft of the future will be propelled by "jet" engines of various types. The older internal combustion engine is reaching the limits of its theoretical maximum power, and jet propulsion enjoys certain other advantages which make it certain as the motive power of the future. There is a smaller number of moving parts, reduced vibration, safer fuel, the possibility of great power for weight, better streamlining and, above all, ability to fly in the stratosphere where the air is too "thin" for the ordinary airscrew. The advantage of very high altitude flights is, of course, that air resistance is reduced to a point where it is so low that enormous speeds are easy to attain.

In the immediate future

there will be a considerable field for the prop-jet engine in which the fuel is burned as in the normal jet engine, but the driving force is obtained, not from jet reaction, but by gearing a turbine to propellers. Within ten years at least 500 m.p.h. should be the accepted average speed for commercial aviation using the turbo-jet engine. By that time considerable progress should have been made with the ram-jet engine, which operates efficiently at higher speeds and which will eventually carry aircraft at well over 2,000 m.p.h. at high altitudes. True rocket propulsion will call for flights at a height of at least 100,000 ft. and will give us speeds of 5,000 m.p.h. and upwards, with a present theoretical limit of about 18,000 m.p.h. for journeys near the earth, and 25,000 m.p.h. for journeys in space. This would make possible the realisation of the ideal which has been suggested of an air service, "anywhere in an hour on the hour," but it would be optimistic to suggest that the great problems involved will be solved in less than fifty years.

A much more immediate concern of aviation is the

satisfactory solution of traffic control problems, likely to become more acute as the turbo-jet engine is increasingly used. The turbo-jet is only efficient at high speeds, and it is impossible to contemplate jet-propelled commercial aircraft being "stacked" above an airfield, circling for minutes or even hours while waiting their turn to land. At present, thousands of flying hours a year are wasted by aircraft waiting in the air or being directed from one aerodrome to another because of weather conditions. An essential before real progress can be achieved is the development of completely safe landing systems which are independent of weather, and of new methods of control so that far heavier traffic can be handled by aerodromes. There is no doubt that these systems will be introduced during the next decade, and that aerodromes will work with the precision of railway termini, and with landings in perfect safety every few seconds. The Berlin airlift alone has provided invaluable experience.

The question of control at airports, which has so lagged behind the development of traffic, can be solved by the

co-operation of technician and organiser. The full and free development of air transport which is promised by technical discovery also calls for the elimination of much of the "red tape" which is a relic of the days when an intercontinental commercial flight was still something of a novelty. The nations will, in the near future, have to co-operate to simplify the whole business pattern which now threatens to bog civil aviation in a mass of forms and documents.

The greatest need for aviation in the near future is that of very greatly reduced operating costs, so that flying becomes, not a luxury, but the usual method of passenger transport. There is hardly a country in the world which at the present time is not losing millions of pounds a year on its air lines, even with the present absurdly high fares. There are many reasons for this failure, but one is the great cost of developing the really large and efficient aircraft which are so essential to the establishment of civil aviation. Once these large aircraft, carrying one hundred passengers and upwards, are in full production, it should

prove possible for fares to be reduced to the point where they are well below those for surface transport today.

SPACE

One great adventure that awaits future generations is a flight through space to the moon. It has been suggested by some experts that such a flight should be possible within twenty-five years, but the figure is likely to be nearer a century. The problem of designing a spaceship capable of making the journey has been solved on the drawing board, but it is often forgotten that we should be exploring unknown territory, and that experience is likely to reveal difficulties of which the very nature is at present beyond our ken. Columbus, when he set out on his great voyage, had, after all, the considerable knowledge of sea navigation accumulated during several hundred years. We know nothing of space navigation, and of what lies beyond

about twenty miles of the earth's surface we are almost entirely ignorant. It is certain that conditions differ in many ways from those of which we have any first-hand experience, quite apart from the thinness of the air and other inferential data.

The appeal of flight to another world will remain, and the moon is as yet the only destination we can seriously consider in the foreseeable future. Even although it is true that when escape from the earth's gravitational pull has been made the energy required to maintain a speed of many thousand miles an hour will be small, a journey to Mars, which has been described so often in imagination, would occupy 200 days, and the time to Jupiter would be nearly six years. These things are not "impossible," but any realistic view of the difficulties of a journey to the planets must put the time in centuries, rather than decades, from our lifetime.

Some thoughts on—

The Electronic Brain

by DOUGLAS F. CHATT, B.Sc., A.M.I.E.E.

THE electronic brains of today have by no means achieved the quasi-perfection of their science fiction counterparts. Nowadays, the term electronic brain is usually applied to members of a large class of advanced calculating machines used in tackling a wide range of problems. Whether these machines truly deserve the name of "brain" raises a controversy which, being largely academic, need not concern us here.

In considering the word "brain" in this connection we think normally in terms of the human brain, which is of the highest order of brains within our sphere of knowledge. We can consider the most important known functions of the human brain under four main headings. Firstly, the brain must be capable of accepting and storing information (re-

ceived by means of sight, hearing, touch, taste, smell or by other, as yet vaguely understood, senses). Secondly, it must be able to sort and classify the information and compare it with other information. Thirdly, the brain must be capable of processing the information and of drawing conclusions from it. Finally, facilities must exist for the communication of these conclusions so that the necessary action can be initiated or considered further. As a simple illustration, suppose that the hand comes in contact with a very hot object. Information concerning the event is transmitted from the hand to the brain, which, having examined the circumstances, reaches certain conclusions. These conclusions may then be communicated directly, in the form of speech, indicating simply, by one

expression or another, that the particular object is very hot; alternatively, or in addition, they may cause muscular action which draws the hand away from the offending object.

In connection with our electronic brain, then, we must consider these four basic requirements. They need not be implemented in any rigid order; as in the case of the human brain they will be met in varying degree and in varying order according to the needs of the problem under consideration. Where, for instance, a problem involves a large quantity of information and many different processes for its solution, it will be carried out in convenient stages, information being dealt with, and results communicated, according to a stepwise scheme devised by the operator.

EVERYDAY MATHS.

All the machines of the class which we are discussing were primarily intended as calculating machines. It might be argued that this restricts the uses of the machine when compared with the wide range of problems which the human brain can consider, and which

involve, apparently, no calculation. It will require little thought, however, to realise that a vast number of problems in everyday life can be considered in mathematical terms—which may, indeed, be extremely complex and involve no clear-cut solution. For instance, statistics is a branch of mathematics successfully applied to a large number of present-day problems which do not at first appear to be amenable to mathematical solution. Even problems such as the choice of a tie and shirt for a particular suit can be reduced to the consideration of a number of factors, fairly clearly defined and capable of logical treatment. Such problems lie comfortably within the scope of our present-day electronic brain.

It should be pointed out, at this stage, that our machine must be provided with all the facts and must be given precise instructions for the solution of the problem attempted. We must know *how* the problem can be solved; that is, we must have worked out a mathematical *method* that can be fed into the machine. Up to this point responsibility devolves on the human operator; from then onwards the

machine will perform the necessary operations, accurately and tirelessly, within the limits of its instructions.

The ways in which the electronic brain performs its work do not involve exclusively modern techniques. As long ago as 1642, the French mathematician, Blaise Pascal, produced a mechanical adding device and the subsequent development of calculating machines has gradually produced improvements in their scope and efficiency. The rapid advancement in electronic techniques has, however, permitted improvements beyond the wildest hopes of most of the earlier inventors. The history of the development of calculating machines has been so ably treated elsewhere and at so much greater length than is possible here that it would be an injustice to the subject to attempt to summarise it in a few short sentences.

BASIC UNITS

Each of the machines of the type which we are considering contains four basic units. There is the input unit, by means of which the machine can be supplied with information and instructions; this

corresponds to the eyes, ears and other sense organs connected to the human brain. Then there is a store, often known as the "memory" by analogy with the human brain, in which information of all kinds can be retained for as long as required. A third unit, usually known as the arithmetical unit, performs all the necessary mathematical processing of information including the simple processes of sorting and comparison. Lastly, there is an output unit, which communicates the results of the machine's work in a form suitable to the users. It will not be impertinent to emphasise that all our original requirements for the brain have now been satisfied.

Just as the human brain is supplied with information by various sense organs, so the machine must be supplied with information in a form which can be assimilated by it. In the majority of cases this is effected by coding the information, using a system of holes punched in cards or tape and then producing electrical pulses by scanning these punched hole systems with a suitable device. A photoelectric device has been recently

demonstrated which "reads" information, not from coded media, but from a printed page, using a specially designed type. Another device, not developed particularly for use with calculating machines, produces a convenient system of electrical signals from speech directed into a microphone. These brief examples indicate that the input system could be made very flexible.

Numerous methods of information storage are used, including the familiar magnetic tape recording. Theoretically, the storage capacity of these machines is unlimited, although in practice economic factors naturally set a limit to the size of the "memory." The arithmetical unit, apart from its simple facilities for comparison, normally includes facilities for addition and subtraction, and occasionally multiplication, but rarely for other mathematical operations. This may, at first sight, appear to restrict the machine's capabilities, but it can be shown that the majority of mathematical operations are able to be carried out by a series of operations involving only addition and subtraction (for example, multiplication can obviously be effected by a

series of additions, and division by a series of subtractions). The number of steps in a problem is then greatly increased, but the speed of operation of the machine outweighs this disadvantage. For instance, in some of the faster machines, two large numbers can be added together in less than two thousandths of a second, and multiplied in less than three thousandths. It should not, however, be imagined that speed alone is the determining factor in a machine's efficiency; other factors, too involved for discussion here, may be more important than speed.

THE RESULTS

The calculations having been completed, the results are then translated by the output into the form required by the user. For most cases, the results will be printed, by teleprinter devices, but other methods can be used, such as the controlling of machine tools or industrial and chemical plant processes. Special purpose computers are already widely used for applications such as aircraft control (automatic pilot), for aiming of guns and search-

lights, and for industrial plant control; such examples must be, by now, quite familiar.

As examples of the type of work which can be carried out on these machines we can note extensive calculations for aeronautical and nuclear physics research, calculations which, although not beyond the powers of the human brain, would involve arduous computations over very long periods, perhaps years, instead of weeks or months as with an electronic machine, with a great likelihood of errors remaining undetected until they have, perhaps, reached alarming importance. Then, many routine tasks such as the preparation of tables of regular functions can be performed simply and quickly by electronic brains. Large numbers of problems in science and engineering, which would otherwise be uneconomical of solution, can be handled efficiently by electronic machines, which, therefore, release human operators for

more interesting and more useful work. Our electronic machines can also be used for sorting and classifying data, say for economic and administrative records or for information research. An example of specialised "non-mathematical" use has been illustrated recently when a calculating machine was used to produce crude Russian-English translations by the use of a coded vocabulary and a coded series of simple rules of grammar.

These few examples, by no means embracing the whole field of applications, will show that our present-day electronic brains, whilst limited in their capabilities, possess all the basic characteristics of those "brains" beloved of the science fiction author, this remark being in no way derogatory of authors or machines! The characteristics inherent in the machines of the distant future will satisfy today's wildest imaginations. Only the form will change, dictated by the requirements and techniques of the day.

AVIATION AS A CAREER



Photos: De Havillands

TODAY opportunities in aviation are greater and more varied than they have ever been. Given a reasonable standard of general education, a young man can join one of the mammoth aircraft firms and actually be paid while he is learning his job! The training takes about five years, but

considering that it starts normally at the age of seventeen, the apprentice is still only about twenty-two when he becomes fully qualified. He is still young enough to make great use of the excellent training behind him. Ahead of him lies a lifetime of accomplishment and well-paid service to society.



Aviation is not only interesting work; it is useful, too, something that the world depends on. And there are so many branches of aviation that any mechanical minded youth should have no difficulty in finding his niche in the industry.

THE ENGINEER

Two types of engineer-bent people are taken into the aircraft industry—those who start as young apprentices, and those who start as university-trained graduates. The apprentice usually comes straight to the firm from secondary, technical, grammar or public schools—with a general education of the matriculation level.

During his five-year course he is instructed in every basic science that plays a part in modern aviation—chemistry, physics, electronics and so on. After this general training, the engineering apprentice goes on to study the application of those sciences to the particular problems of aviation. He gets a thorough grounding in all aspects of the aircraft industry. With this broad knowledge at his fingertips, he has no difficulty in acquiring corporate membership of the aeronautical or other engineering institutions. He is a trained man, a professional, someone who has got somewhere in life. One major aircraft firm claims that at these engineering apprentices

"represent the backbone of the whole training system, and provide the main pool from which the industry's future executives are drawn."

The engineering graduate comes, of course, from the university, where he has taken a science degree, usually in engineering, physics or mathematics. Unlike the apprentice, the graduate tends to be rather academic in outlook—a mood fostered by university life—and he most frequently fits best into the

laboratories, aerodynamic and stress departments of the industry. It is the apprentice who finds his way into the design and production departments.

Graduates normally have a course of training lasting two years, at the end of which they take one of the engineering institution's qualifications. They are thus about twenty-three when fully qualified.

Very often—the more often the better, as far as the firm is concerned—the student gets in touch with the industry during his first or second year at the university. The firms then arrange vacation work and develop a plan of training ready for when the student graduates, specially suited to his particular aptitudes.

Both the engineering apprentice and the engineering graduate tend to specialise towards the end of their course. Although they need and are given knowledge of all branches of their profession, they usually develop a special interest in one department. The final stages of their course will lay emphasis on this special interest, so that when they finish their training they are in a position to take up a job immediately in their chosen department.

TRADE

Another type of entrant to the aviation industry is called the trade

apprentice. These come straight from an ordinary school, without the General Certificate of Education or equivalent. For them, the aircraft industry is like a rich uncle from Australia. Quite literally it converts what might have been a dull, unrewarded life into a career of promise and pride. Naturally, co-operation and hard study are required of the trade apprentice in return for the help and encouragement he receives from his firm. But, given these things, together with a quite reasonable amount of native ability, the youth who, because of domestic circumstances, must leave school before his more fortunate contemporaries, can become a highly skilled operative, respected and admired by his superiors and earning a most comfortable wage.

Quite often the potential trade apprentice leaves school and takes a

job in the aircraft factory—fetching and carrying, perhaps, or some other dry, unskilled job. He comes under the watchful eye of the firm's educational staff and is encouraged to go to evening classes to raise his level of general education. Time off during the day is given and frequently the fees are paid by the firm. When he has reached a sufficient standard of general education, the firm accepts him as a trade apprentice.

Classes in general education are continued with the aid of the county authorities, and the young apprentice has his mind effectively broadened by instruction in Empire history, citizenship, current ideas and ideals, while at the same time aeronautical studies gradually increase. As one firm says, "It is useless filling boys' heads with technicalities until the basic education has taken root. They must learn about





their country and their industry, acquire a pride in work, and appreciate where they are heading." These are the things that make a boy into a man—a boy who might have stayed a boy all his life.

Many of the trade apprentices become highly skilled workmen, in positions of authority and great trust. Others, perhaps those with greater drive or greater talent, rise to a standard where they can be accepted as engineering apprentices and, thereby, take the complete training of an aeronautical engineer, with the appropriate qualification of one of the engineering institutions. So it is that the boy from a poor home, or from a home which does not engender the idea of ambition, can be set on the path that leads to the highest positions in aviation.

EMPLOYMENT

The avenues of aviation work are so numerous that we could not possibly deal with them all here. Suffice it to say that, once qualified, the youth who takes up aviation as a career has endless opportunities

at home and abroad. There is an almost limitless number of departments from which he can choose his speciality—civil aircraft, military machines, guided missiles, and each one of these has its sub-branches of design, performance, electronics, stress, aerodynamics, construction, metallurgy and so on.

The youth who takes up aviation does not have to look around after qualifying to find somewhere to work. *His* problem is to decide what *not* to do!

And this is, after all, an industry of the future. There can be no doubt in anyone's mind that the next few years will see a tremendous expansion in the aircraft business—not only because of the paramount military importance of aircraft, but because of the rapidly increasing amount of civil air transport that is being required. New air routes are opening up all the time, and aircraft are needed to cover them. The steep competition between airlines for more and more passengers and freighters keeps up a constant demand on the manufacturers for bigger and better airplanes.



PLANETARY EXPLORATION

4 THE ESSENTIAL CHEMIST

No spaceship crew will be complete without a clever chemist, says WILFRED READER, B.Sc., writing as from the future

BELOW IT OR NOT, WHEN THEY DREW up the list of experienced scientists to travel on this first party intending to reach a planet, they did not include a chemist! *I had to compel them to include me in.*

Chemistry, of course, is the only branch of science that really matters! All the other sciences are merely auxiliary services which the chemist finds useful. Your botanist finds plants and puts them in family groups by pulling them to pieces and then

sticks names on them and thinks that he has done a useful job of work. The chemist comes along and gets drugs, dyes and who knows what else out of the plants and gives them a value and a purpose. The geologist sticks labels on rocks. The chemist converts them to metals, ceramics, building materials, glass; uses them in fact. Physics and mathematics are only tools for the chemist—very valuable tools mark you.

Moreover it is the chemist who maintains the other directly useful sciences. The surgeon comes to him for his anesthetics and antiseptics, the physician for his purges, prophylactics and analgesics, the agriculturist for his fertilizers, insecticides, fungicides, weed killers and even for the gases to ripen his fruit.

When I explained all this to the organisers they said: "Very well—let your collectors go out and bring back all you need. Let your servants be your servants."

Maybe they had something there. "But," said I, "you want them to come back. Without a chemist they'll be helpless babes. Do you want them to step



Photos: Shell

out on landing into a chemically unknown atmosphere? Would you have the outlet valve of their breathing apparatus open into vapours that explode when mixed with expired air? Suppose they do find water on or under the rocks. Have they got to drink it first to discover whether it gives them extra time to stay on the planet or no more time to be anywhere?"

Then they had the confounded impudence to ask me if I couldn't train one of the operatives in the crew

asked of them, and done it well, but the trouble is you don't know enough to know what to ask them and they would not know enough to be able to tell you anyway. A simple example: you wanted portholes in your spaceship. You went to Sudnorth the plastics chemist. He gave you Constitflex as a transparent substance with a negligible coefficient of thermal expansion, resilient to internal and external pressure differences, and of considerable shock resistant qualities, all combined with lightness. Did you tell him about the extra ultraviolet light in solar radiation which has not filtered through atmosphere? It didn't matter? Do you know what will happen if you send that stuff into space? Whenever it is facing the sun, it's going to fluoresce. Instead of merely letting light pass through it, it will be itself a source of light—a beautiful pale pea green. Your navigator will be charmed by it, no doubt, but he won't



be able to see the stars or planets through it. He might be quite unhappy without these space-marks.

"Whether you let me travel or not, I would be very happy to be allowed to go over as many specifications of materials in use as possible to see if I can hit on any other snags for you."

I GET THE JOB

Our wrangling was a little less strained after that, and ultimately the top beaurocrat said: "This man certainly wants to go—and that alone

to carry out routine gas and water analyses. They even named a price for such services! As if any mere cash could compensate for the torment of wondering how the poor idiots would be making out, and me not with them.

So I said, just to show them: "I'm wondering already why you did not consult a man like me before you began to plan at all. You went to Kaddens the fuel chemist, to Paxon the metallurgical chemist and to half a dozen other specialists. I don't doubt that they have done all you

is a major qualification." Blendersen, the best scientist of the bunch, said: "He's made his case to my satisfaction." Connie Coolson, the last of the big-scale heiresses, who had put up a lot of the money, said: "I think he's sweet."

So I am going on the first journey to a planet.

Now I am setting other people to work for me. I have an air flow specialist devising a gadget which will be on the outside of the vessel. As soon as we enter any kind of atmosphere, no matter how rarified, I shall have small cylinders filled with it at high pressure. I shall also have a discharge tube filled at very low pressure. A spectrometer trained on the light from the tube will give me knowledge of the elements in the gases. On this information I shall base the tests to determine in what proportions and in what chemical compounds the various elements may be present.

Within a few minutes I shall be able to complete a full analysis. It's going to be touch and go as to who gets first news of the existence of an atmosphere, I, with my collection gadget, or the physicist with an inertia pellet on a hairspring to make or break one of his electrical circuits. Personally I back my discharge tube.

Second by second I shall be adding to my knowledge of the air we may or may not be able to breathe. I shall be passing on my news a word or two at a time, and listening for others' reports all the way down. Interesting as the

outer layers will be to me, I shall be well down into the stratosphere before I shall be justified in saying much.

FIRST REPORTS

Then, at intervals: "*Air pressure beginning to build up—.05 lbs. per square inch.*" That will interest the pilot. The hull will overheat if he's sniralling into that much air too quickly.

"*One pound per square inch—Oxygen present.*" That will have everybody



hoping it may be possible to dispense with spacesuits. "*Four pounds per square inch. Two per cent. oxygen as carbon dioxide. Five per cent. as breathable oxygen.*"

Already we begin to feel that a rupture of the ship's casing on landing will not be catastrophic.

"*Final air report. Twelve per cent free oxygen, two and a half per cent. carbon dioxide, four per cent. sulphur dioxide. Can breathe if must through alkali filter pad. Don't get too energetic.*" Not perfect, but it might have been much worse.

POCKET LABORATORIES

I have set the best of our technicians to work making test tubes, thermometers, fractionating columns, electrolytic cells, furnaces and such which can only be useful when observed microscopically. A lapidiarist is making for me an exquisite little synthetic diamond milling machine for preliminary crushing of dust particles. An ultrasonics expert is making a little resonance case in which the crushed dust can be further reduced to particles so fine that by comparison a wisp of cigarette smoke is a hundredweight of coke.

Finally, I shall have a dozen or so pocket cases each of which is a laboratory in itself. These will be for my own purposes purely as a research chemist. The air tests will be for the welfare of my fellow explorers and for the success of the expedition. In similar manner, on landing, I shall have to make my first tasks those that are necessary for our immediate progress.

WATER—IF ANY

I have requested that any water that may be found shall be left for me to analyse *in situ*. I shall have been informed already by the physicist of any radioactivity in excess of safety intensity. I shall not, however, consider the water safe to handle until I have seen its effects on living creatures. I shall take with me from earth some of its denizens: fish, moulds, mice, birds and bacteria. It will be most important to ensure that none of these escape to spoil the planet's balance of species. Having assured myself that the water is not dangerous, I shall get a sample back to the ship and reach for Box Laboratory Number One. The water will be put into a pea-sized jar with a stopper which looks like a head of groundsel seed. Each fibre-like tube from the jar is already connected to

one or other of many bare'y visible test cells, each of which can be brought under microscopic, spectroscopic, colorimetric or other appropriate scrutiny.

Within five minutes of opening the box, I shall know the acidity or alkalinity of the water to three places of decimals. I shall also know the boiling point under any pressure, the concentration of all metals which may be present in solution, what other elements are combined with the metals, the degree of hardness of the water—indeed, all the things needed to determine how it can or cannot be used. Another five minutes at my leisure will give me information of more academic interest, such as the proportion of deuterium with the normal hydrogen of the water, or if you like, the amount of heavy water present.

Box Laboratory Number Two will be likewise equipped to give the answer to as many questions as I can remember to ask about sample upon sample of the planet's soil or surface dust.

Box Laboratory Number Three is the prettiest of all. Its little distillation chambers alone are a wonderful achievement comparable with some of the precision of nature in such organs as a humming bird's balance mechanisms. With this I hope to be able to discover much about the new colouring matters I shall find in plants and animals that have developed under another sky than ours.

A list of the purposes of my several boxes would be as tedious reading as a manufacturing chemist's catalogue. In the main I have tried to plan each box to do a job best done quickly. Analysis of things for use at once, of things that are unstable and might not last out the return journey, and of things that might act as guides to where to look for other things.

It came from out of the blue, appropriately, for it was a—

BLUE ROSE

by RON PAUL

OLD HARRY STARED. HE HAD SEEN nothing like it.

A rose—its petals half open—hung outwards from the top of his rose bush. A slight breeze swept through the country garden and the bloom swayed gently. It looked beautiful; a perfect English rose.

But its colour was a pale blue!

Gardening was a hobby to old Harry. Since his retirement to this country cottage he was always in the garden. Each day, when lunch ended, he would light his pipe and rise. "Just going to the garden, May," he would tell his wife, then slowly wander out. Such a quiet, peaceful, restful life.

The blue rose swayed in the breeze. Harry's old head followed it—fascinated. To and fro . . . to and fro . . .

A tiny bird fluttered down. It settled on the rose. The bird squeaked shrilly. It flashed by his eyes and landed a few yards away. Blindly, it soared into the air only to blunder into trees and bushes. It hopped about the tall grass flapping its wings. He tried to catch it, but it flew at his face, pecking at his flesh until he was forced to beat it off. For a moment wings beat the air furiously. Then, silence. He uncovered his eyes. The bird had gone.

He stared at the rose. The flower itself was the same, but around it was a haze of richer blue; a shimmering haze that seemed to pulse tremulously. Old Harry turned and hurried to the nearest 'phone booth.

•

The scientists arrived soon after. The flower still danced in the breeze to mock those who tried to reason its existence. For hours they surveyed it, photographed it, made notes and

departed. More men arrived; they, too, left. Night came. In the darkness the rose glowed and everything around reflected the peculiar blue.

The following day a shiny car arrived. A crowd had already collected about the rose. Paul Dunlay, from the Kenstan Laboratory, got out. A waiting photographer flashed his camera. A reporter approached him. "I'm from the *Daily Observer*. I wonder—"

He pushed by. "Not now. I know nothing about this." A stout man came to greet him.

"Carter," said Dunlay, "glad you're here!"

They threaded their way through the people. They reached the rose. "What the devil is it?" asked Paul.

The fat man chuckled. "They sent you to find out."

"When was it discovered?"

"Sometime yesterday. The owner of that cottage found it. It had some peculiar effect on a bird, so he sent for us. The old man says there was a blue haze encircling the rose. As you see, there isn't now. No tests have yet been made. As you were placed in charge, we waited for your instructions. We had it photographed and copied."

"All right, we'll make a few tests now." Using a pair of tweezers, Dunlay separated a petal from the main flower. The petal dropped lightly. It lay on the grass—colour unchanged; still the same peculiar blue.

A mongrel dog nosed its way through the crowd. It scampered to Dunlay and wagged its tail. He sighed and caught the collar. "Who owns this dog?" No one answered. The dog strained and got away. It saw the petal and growled. Ears swept back, its nose bent cautiously and sniffed.



Howling madly, it spun and darted for Dunlay's throat. He twisted and sprawled helplessly on the ground. The dog leaped over him and darted, frenziedly, at the legs of watchers. Kicking it viciously the men held it off. A moment later, still yelping, the demented animal ran wildly to the back of the house.

Dunlay turned abruptly. "Carter, I want these grounds roped off. Only scientists are to be allowed entry."

He turned back to the rose petal. He stared. "Just a minute, Carter—look at this!"

The petal was just an ordinary pink. "What's happened," asked Carter, "to the blue?"

Dunlay thought for a moment. "Of course—the dog!"

Carter stared. "What—?"

"Come with me. We'll find out!"

Dunlay raced to the back of the house. Carter panted laboriously after him. There were sounds of snarling and scuffling. They rounded the corner of the house and paused. The dog was



rolling over and over madly, a cat clawing savagely at its throat.

Dunlay picked up a heavy stick and cautiously advanced. The stick rose and fell twice. The necks were neatly broken.

He stirred the body of the dog. "There," he said, "that's what happened to the blue from the rose petal."

Carter bent forward. The dog was quite visibly blue. "The flesh is probably the same under the hair," commented Dunlay.

"Look at the cat!" said Carter.

The belly of the cat was plainly the same blue; and around both animals was forming a distinct bluish haze.

"I want those bodies taken to my laboratory" said Dunlay. "And on no account must they be touched by hand."

It was the following evening. Dunlay stood with his back to the rose. Carter leaned against a gardening fork.

"What we know, then, is this: An ordinary rose has been entered by some—er—substance. This blue sub-

stance has never been experienced before, and my guess is that it drifted in from outer space.

"All we know about it is that it readily makes its home in living organisms—which includes plant life. It does not invade inanimate objects like the tweezers I used. Judging by the effect on the dog, part of it can be cut off from the main body and act independently.

"The effect of its presence in living organisms is insanity. This blue substance is also able to expand amazingly; the small amount of it on the petal completely covered the dog and cat."

Dunlay stared at the rose and sighed. "I examined the dog and cat. Nothing was wrong except their brains. You might almost say they were eaten away . . ."

Carter stared. "The brains?"

"Yes. Charred in places as if an electric current had shrivelled them up. Carter, I have a theory: This blue substance is living matter and it feeds on the mind—nerve impulses."

"But if it comes from outer space, how could it exist out there?"

"I can only suppose it thrives on other things, too. Unless it set off from wherever it originates in a tremendous body which gradually diminished through lack of food. That would fit in. After a feed it grows—that accounts for the haze; just an increase in size. That's why it faded on the dog and cat—it can't exist because they are dead—no nerve impulses—no food. There's one thing certain. It is a danger to man. If that blue substance reached a human a wave of madness could sweep the country."

"Would the insanity be infectious?"

"More than likely. The dog caught it from the rose. The cat caught it from the dog. No telling where it could end."

"What about the bird that was first affected?" said Carter. "If that reached humans . . ."

"I've been worried about that," said Dunlay. "I don't think it could exist

in that state for long—it would probably die. Better issue a warning."

"I'll arrange it now," said Carter.

Dunlay nodded. "I want to observe its behaviour at night, but you needn't bother coming back. Get some rest."

"Thanks. See you in the morning."

Carter's bulky form disappeared. Dunlay turned.

The rose was glowing slightly—a soft unearthly glow. The evening breeze stirred it. Dunlay lit a cigarette and watched it rock lightly.

"Excuse me, sir," said a voice. "There's a reporter demanding to see you. He said it was most important."

"All right."

They walked to the barricade.

"Hi, Dunlay," said Wilson. "I want to take a picture of your rose."

"Photographs will be issued to the Press soon."

"I want a chat with you, too." Wilson's eyes looked mocking—amused. "I've a theory about your rose."

Dunlay sighed. "Let him through, constable."

Wilson grinned. He sauntered past Dunlay and put a cigarette to his lips. "That fat chap—Carter—he told me this drifted in from outer space. Hey, don't get worried. Our chat was strictly confidential—off the record." Wilson walked rather unsteadily to the rose and surveyed it.

"Don't touch it!"

"O.K.—O.K." Wilson grinned. "You think this is living, don't you?"

"How much did Carter tell you?"

"Not much. I had to buy him a little drink or two before I even got that. Y'know, Dunlay, I think that blue stuff is intelligent."

"Perhaps . . . perhaps not."

"I'm convinced. It would have to be to travel through space."

"Not necessarily. Birds manage to cross seas each year; you manage to find your way here from a pub—I wouldn't call either of you intelligent."

"If it was intelligent, it would behave quite differently from humans, wouldn't it? From what Carter said,

it goes to the brain. It should be capable of telepathy at that point. It should be able to talk."

"Ridiculous!"

Wilson's eyes mocked him. "I'm going to try it, Dunlay."

"Don't be a fool. You'd be risking your life. You don't know what you're playing with. Leave me to my job—you stick to yours. Why risk your life? What would you gain? Nothing!"

"What a story it will be! The first man to converse with it. Can you see the splash? The man who interviewed the blue rose!"

"If it affected you there's no telling where it would end. You'd touch someone, they'd go mad—they'd attack someone else . . . and it would go on and on and on . . ."

Wilson laughed again. "You're scared!" He reached out to touch the rose.

Dunlay lunged forward. They fought silently in the darkness.

Wilson sent a powerful blow to Dunlay's face and sent him reeling against a bush. A foot cut cruelly into his stomach and he fell. From the ground, he dazedly watched Wilson reach for the rose. The hand closed over it.

The reporter's face was suddenly contorted. It turned pale blue. He stood in the moonlight. Terror filled his bulging eyes. His mouth gaped widely with horror and pain.

Then, he screamed horribly. He began to jabber incoherently. He shrieked wildly and his eyes seemed filled with hate. He tore a gardening fork out of the ground and it flashed in the moonlight.

The points thudded into Dunlay's neck as he lay on the ground helpless. As through a mist, he saw the rose lying a few yards from him. It was an ordinary pink.

His pain-filled eyes watched with growing horror as Wilson, now crying like a child, lumbered away down the country lane towards the lights of the nearby town . . .

THE WELL-DRESSED SPACEMAN

by JIM HARMON

Moving around in space is sure to mean special clothing. Here an American Scientist examines the possibilities.

Men have already experienced many of the conditions they will face in outer space and survived. As anyone who has ever been in a war or crossed a street against the traffic can tell you, the human body is an amazingly resilient piece of equipment. But the human body isn't tough enough to stand up against absolute zero or careening meteors. Human beings will need protection against the rigours of the interplanetary void.

There have been several schools of thought as to what that protection must consist of, and since no one has yet been into space, the question is not completely settled.

At the far end of the maximum protection line is Fletcher Pratt, equally well-known as a military expert and a science fiction writer. Pratt has often contended that men will have to be decked out in heavy armour with mechanised grapples for hands. He even says that these suits will have to be made out of some harder-than-steel alloy that we don't yet possess. This has been pointed out in his books for junior space pilots.

There is some doubt that early science fiction writers were equally as convinced of their stand. Authors like Robert E. Howard represent the ultimate opposition to the views of men like Pratt. They suggested that a supply of oxygen was all a man would need to stay alive in space.



Photos: Ackerman Agency



The real solution to this very real problem must lie somewhere between these extremes. All of us are constantly being bombarded with varying versions of the spacesuit via the covers of science fiction magazines, national weeklies, films, comics and television screens.

If you look at Commander Cory or Tom Corbett you'll notice that their space helmets have face plates cut out of them. This serves two purposes: it keeps the actors from suffocating, and it keeps children from a similar fate when they demand a helmet just like that! In actual space conditions, cut-out visors would be rather a fatal handicap.

We do know that there must be some kind of pressure on the entire body at all times to keep a man alive in the great vacuum. Contrary to some reports, men would not burst like balloons upon the loss of air pressure. Sand-hogs, working in sealed underwater tunnels, often suffer from conditions similar to those men will encounter in space. Bends is the occupational hazard of these construction men. When they return to normal atmospheric pressure too soon after being subjected to pressures three and four times greater than normal while working in underwater caissons, they experience dizziness, difficulty in breathing, and even paralysis. It is caused by release of tiny bubbles of nitrogen gas from solution in the bloodstream. Spacemen will also have to worry about the bends.

However, the pressure differences spacemen will experience will be even greater than those felt by ground-hogs. Release of nitrogen will be a minor concern. Internal pressure will not be counteracted by a similar outside pressure. Blood vessels will rupture almost immediately when human skin is exposed to space. If that area is not covered soon or if a large area is exposed, death will be the result for the explorer.

There is no question that the human body must be kept under pressure, but

there is a question as to what must provide the pressure. The usual answer is an air-tight suit—an old idea divers have been using for generations. Practical but unimaginative, say some scientists.

These men suggest some kind of tight binding—like surgical binding for sprains. The advantages would be that it's less complicated, therefore less likely to get out of commission, more flexible and comfortable, and less expensive.

The material would be semi-porous to allow natural body perspiration. We perspire in hot weather because that way our bodies can expose liquid to the air and evaporation take place; evaporation is basically a cooling process. Space is not hot, but very cold—theoretically as cold as anything can be, since there is a complete absence of heat in the natural properties of a vacuum. Heat travels through space, however, as light waves—radiant energy. If you've ever got as bad a sunburn as I have, you know sunlight can be hot enough, even through a protective layer of atmosphere. Without that air protection, it is even hotter.

An elastic-binding spacesuit would be white—as any spacesuit would have to be—to reflect as much sunlight as possible. The natural process of perspiration and evaporation would have to cool the spacemen off—a hard task if he was a hot-headed Irishman!

Such suits wouldn't be much protection from passing meteors, but it's argued that a meteor is like an atom bomb—a direct hit would be fatal, anyway.

The more familiar type of spacesuit—the one we most often read about in science fiction—is the armour suit similar to the one proposed by Pratt. Usually writers allow for the development of some kind of gauntlets for the hands and a transparent helmet. The human hand is the most efficient tool the human race has ever had, and heads must be visible so that we can recognise the heroes from the villains.



On closer inspection Pratt's statement that we will have to invent new materials for spacesuit construction doesn't hold up.

Pratt states that viewing plates in spacesuit helmets—and direct view portals in spaceships—could not stand up against the difference in temperatures inside and outside. This is easily circumvented by using *two* pieces of transparent plastic or quartz and leaving a *vacuum* between them. The differences in temperature inside and outside would have no effect on the separated sections.

It is also suggested by Pratt that spacesuits and tools of any known metal would snap in the intense cold of space. Actually under certain circumstances the metal would have to be refrigerated to be kept from melting under solar heat. In instances where they were shadowed from the sun a slight amount of heat, which could not escape into the vacuum, would keep the metal from becoming brittle.

You'll notice that I'm running hot and cold on this business of spacesuits. The fact of the matter is that one of the most serious problems in designing such a suit is air-conditioning, or rather *space-conditioning*—alternatively being able to heat and cool the spacesuit. The same thing will have to be done to the craft in which the space pioneers ride.

Dr. Donald H. Menzel, of the Harvard Observatory, is perhaps best known for his logical debunking of flying saucers, although he has himself been debunked for his narrow view of

the matter. Dr. Menzel is a practical man. He plans a porcelain-white spacesuit to reflect solar light, with metal fans jutting out like miniature wings to radiate the heat into space. He doesn't say how this one-way effect will be realized and why the fans will not pick up radiant heat and transmit it back into the suit.

The key to the problem is that no heat will escape into space but all heat in space can be absorbed by the spacesuit without proper shielding. Every movement of the spaceman will create friction inside the suit and friction will create heat. Natural body heat will be added to this, plus what radiant heat from space that cannot be shielded out. The main problem will be *refrigeration*, with some heating facilities for emergencies—such as having to stand motionless on the side of a spaceship opposite the sun.

Actually the elastic-binding suit, depending on white reflection of light and normal perspiration, would not be sufficient for this, unless some kind of heating-cooling circuits could be woven into the material—an electric blanket in reverse.

The first suits used in space will probably be made of some lightweight, known metal—perhaps aluminium or stainless steel—and be pressurized with oxygen and helium, as are diving suits today. They will probably look much like the pictures of them look today, but their face-plates will be solid. Junior's own little Junior will have to be satisfied with a version *not quite* exactly like his father may wear.

Life—and space—had made him bitter;
until he made a—

Personal Call

by JONATHAN BURKE

SOMEWHERE IN THE background of his consciousness the noises of the ship still vibrated, but his thoughts were quite detached. His mind was far away: he reached out across interplanetary space, sank into the warm beauty of his wife's thoughts, and said: "Can't stay long. We're back in the freight lanes, and I'll have to take over in ten minutes or so."

"Having a good journey?" she asked.

"It's the journey home. That's always good."

For a moment their minds were silent. There was no need to shape words and sentences. They rested in the contented awareness of one another. Then she spoke in her ordinary voice: "Stephen . . . daddy's here."

She turned her head, and through her eyes he saw the boy come eagerly through the door.

"Hello, Steve," he said, using his wife's voice.

Stephen peered at his mother's face warily, as though wondering whether she was just being playful, just pretending that his father was here. He said: "Where are you now?"

"Coming in around Neptune."

"Tell me what it's like."

Captain Masterman told him what it was like. He told him about the unchanging brightness of the interplanetary night, as he had told it so often before, and of the adventures in the mining outposts. The boy nodded eagerly. Then Masterman told more gravely about the death of

young Wilson; and, in addition to the boy's solemnity, was aware of the shock of sympathy from his wife's mind. He was married? she silently asked. He confirmed that yes, Wilson had been married. Children? No, no children. The wife had been notified.

Her thoughts now were confused, but he interpreted them without difficulty. The old fear came bubbling up through her mind—fear that he, too, would one day have an accident with his oxygen supply on some craggy asteroid, or that his ship would blow up out in space as others had done . . . that he would not return.

He tried to reassure her. "I haven't got long"—he directed her eyes towards the clock so that he could check on the time he had set himself for this visit—"so don't let's be morbid."

"Of course not. I'm sorry. Well, then . . . Are you bringing us a lot of nice presents from the stars?"

"You're just greedy," he said.

He could feel her probing affectionately about in his mind, trying to guess what he had bought for her, or what new and fantastic thing he had wrested from some unknown world. She was baffled.

"You're awfully good at hiding thoughts," she protested. "How do you do it? How can you shut things off like that?"

"It's a trade secret," he said.

The ten minutes was quickly up. He left himself enough time to say goodbye to Stephen and to exchange with his wife a brief, light thought that was the equivalent of a kiss; and then that room at home was fading, and the walls of his ship closed in around him once more.

Noise swooped in on him again. The perpetual resonance of the ship shuddered through him, and the thump of the boosters reminded him that power was being built up so that he could set the new course in a few minutes' time.

He sighed, removed the clips from his temples and

ears, and switched off the communicon.

Almost at once there was a sharp rap on his door. No peace. No time to readjust oneself to this bleak, cramped atmosphere. His home fell away into the remote distance, and he was Captain Masterman of the *Venturer* again.

"Come in."

Lieutenant Hardy came in with a worried expression on his babyish face. Hardy always looked worried. It would probably turn out to be something to do with the air supply: he was always suspecting it of being poisoned, or of getting choked up.

"Well, Hardy, what can I do for you?"

"It's the scrubber, sir. It doesn't work."

Masterman stared, then relaxed. He might have known it would be something fantastic. Really, the things this youngster dreamed up . . .

He said: "Of course it works. I've just made a call home, and before I went I blotted out one or two thoughts I didn't want to

get through. Perfectly respectable thoughts," he added, hastily. "Not the sort that some of our colleagues have to blank out."

"That's the trouble," said Hardy. "After you'd gone, two of the crew made five-minute calls home while the channel was in use. And they came back pretty sore. They'd gone through the scrubber before leaving, but their wives at once picked up the details of last week's visit to Cassandra City."

"Phew! That's bad."

"It certainly is."

"You haven't carried out any further experiments?"

"Haven't had time, yet. I thought I'd report to you first."

Masterman pushed himself off the bunk and onto his feet. "We'd better go along and see about this."



Two angry ratings were still sitting in the communicationsroom, telling the operator exactly what they thought about him. The operator was defending himself in language acquired from a wide range of spaceport cafes. They all

sprang up and shut up as Masterman entered.

He nodded peremptorily at the older of the two ratings.

"Now then, Briggs, tell me the story. Without trimmings. What happened to you?"

Briggs told the story resentfully, unable to resist just a few trimmings—little decorative touches concerned mainly with the operator's ancestry and his manifest unfitness for space service.

Briggs felt that he had been very badly treated. He had followed the usual procedure, done everything the way it ought to be done, and this was what happened. He had made his formal application for a personal call home, and it had been granted. He had arrived at the communications room five minutes early, and had brought to the surface of his mind all the memories of that riotous weekend in Cassandra City, so that the emanation rectifier—known to one and all as "the scrubber"—could delete those particular mind waves. It was not safe to use

the communicon and visit your wife's mind if you hadn't first taken the precaution of washing out all recollections of recent debaucheries.

The wives knew nothing of the scrubber. Masterman had often thought how unfair it was that, while the invention of the communicon had meant not only that men could keep in close touch with their families from the farthest reaches of space, but also that they could be sure their wives remained faithful to them—since nothing in their thoughts could be hidden—the men themselves had the advantage of the scrubber, which smoothed out and destroyed inconvenient memories. Unfair . . . but a good thing from the point of view of the commander of a ship. The men were happy, their wives and families were happy. Far more intimate than any radio call could ever be, these personal mental contacts kept the men stable. It was inevitable that they should break loose at each planet-fall; but for the sake of family life it was as well that

no news of these uproarious occasions ever reached home.

But now the rectifier was no longer working. And that meant trouble. They were heading into the solar system, with several calls to make on the way home—and the cities of the home planets were more riotous and had more to offer returning voyagers than the scattered outposts they had been visiting during the last few months.

Masterman said: "All right, let's get it fixed. Top priority. This is Wilson's job, I think."

"Yes," said Hardy, and looked at him.

Masterman groaned. Wilson was dead.



SIX hours later Hardy came to report to the captain. The expression on his face was enough.

"No luck?" said Masterman.

"None at all. It's not an ordinary electronic engineer's job. Very specialised stuff—and they don't go out of their way to train everybody in repair work on it."

"This is just wonderful," growled Masterman.

Hardy said: "Of course, sir, it's not what you could call essential equipment. I mean, it won't prevent us getting home safely."

"Quite a few men on this ship won't be safe once they've *got* home," said Masterman grimly.

"There are two possible courses of action," said Hardy.

Masterman's eyes narrowed. He studied the young lieutenant with something amounting to distaste. He was not optimistic about the forthcoming suggestions.

"Tell me," he invited dourly.

"Well, sir, either we must rule out visits home, or else cancel shore leave. It's only a week or two before we get home. The men can manage that long without—er—indulging in too much fun and games."

Masterman nodded sadly. His worst fears had been realised. He said: "There are times, Hardy, when I wonder what made you take

up space service. You are a very pure and serious-minded young man, and I marvel at your inability to appreciate the character of other people."

Hardy flushed. "I'm not condemning the men because they want to make whoopee, sir—"

"You're not condemning them, but you're ready to look disgusted when I tell you that they can't be expected to give up their pleasures. After a man's been droning about in deep space for months on end, he has a great hunger for the delights of the dirtiest, nastiest space port—and by heaven, he deserves them. Any captain of a ship will tell you that, Hardy."

"Yes, sir."

"It's my duty as commanding officer of this crate to make sure that we get home safe and sound, and that the men work at top efficiency—particularly now that we're back in our own traffic lanes. Keeping them away from the spaceport dives won't make 'em efficient. And"—he went on harshly before Hardy could interrupt—"the other idea

won't work. The nearer they get to home, the more their wives expect to hear from them. They'd be suspicious if we abandoned the mental contact sessions. They'd be pestering Interplanetary Traffic Control every minute of the day, asking what had gone wrong, raising hell."

"I suppose so."

"And don't look so smug and self-righteous about it, man. You and I don't need to let ourselves go in the same way—or if we do, we know it's our job not to do so. But the men are entitled to it. And they're entitled to make personal calls to their wives. Something's got to be done."

"I don't see how we're going to manage both, sir," said Hardy, with a certain satisfaction. "Not without an awful lot of trouble."

Masterman did not answer. He sat with his legs sprawled out, his back pressed against his chair so that the steady vibration from the floor ran up his backbone like a soothing massage.

At last he began to nod slowly, and then said: "Send

in the men who've been working on the scrubber."



THREE were three of them. Masterman studied them. Already he was sure which one he would have to choose.

He said: "We've got to get this thing fixed. I don't have to tell you why."

"We've done our best, sir."

"I'm sure you have. Given the final details, you'd be able to fix it. You—Maxwell—you did communications training, didn't you?"

Maxwell was a tall, rangy, insolent-looking man who tackled everything he did with a sort of contemptuous offhandedness, as though he never needed to exert himself. Now he said lazily: "I did, sir. But not this sort of thing. Never handled this equipment."

"But given the general principles, you'd be able to work out what was wrong?"

"Maybe. But all we've got is the circuit chart and technical regs. They don't make sense to us. We're not getting anywhere."

Masterman took a deep

breath. This decision had to be his, and he was still not sure of its ethical rightness.

He said: "The only thing to do, the way I see it, is for one of you to visit Wilson's widow."

There was a moment of stunned silence. One of the other men was the first to speak.

"That wouldn't be right, sir. Besides . . ."

"Well?"

"Well, sir, you can't be sure she knows anything about the working of the scrubber. Wilson wouldn't have shared his thoughts about that when he was calling home."

"Not consciously, perhaps," said Masterman. "But I am sure that his thought patterns must have imposed themselves on his wife's mind. I do know"—he smiled ruefully—"that my wife understands a lot more about the running of a spaceship than I would ever have thought when these personal mental contacts started. I think it most probable that if one of you visits Mrs. Wilson—with her permission, of

course—you will find that an instinctive grasp of the principles of the emanation rectifier will be acquired. You'll withdraw your mind from hers and come back here . . . and you'll be able to tackle the job."

He looked at them questioningly.

Two of them shuffled.

"Not me, sir."

"I don't fancy it, sir."

Masterman raised his eyebrows in Maxwell's direction.

Maxwell's smile was cynical. He said: "Might be interesting. Might be very entertaining."

"There'll be no nonsense," said Masterman, sharply. "If I can get permission—I'll have to get a special channel to Base, and heaven knows whether they'll play or not—if I can get Mrs. Wilson's permission, I expect you to be courteous to her. The whole thing is unusual, and we don't want trouble. There could be a hell of a row if you try any funny business."

"I quite understand."

"Good. Then I'll take the necessary steps to get this organised."

The men went out. Hardy, who had been standing to one side, licked his lips and looked inexpressibly pained.

He said: "This is most irregular. I really feel it would be better—"

"Do you think I like the idea?" snapped Masterman. "It's just that it's my duty to get this ship home in good order, with a satisfied crew. I'd sooner pay the call to Mrs. Wilson myself, but I'm not an expert on electronics, and Maxwell is. Maxwell's intelligent." He sighed. "I only hope he's intelligent enough to handle the business."

MAXWELL entered the communications room and sat down while the operator fastened the clips and set the timing mechanism.

"Five minutes, the Old Man said. Think that'll be long enough?"

"If there's anything there," said Maxwell, "it ought to come across in a matter of seconds. I'll fill in the rest of the time with light conversation."

The operator looked

dubious, He didn't much care for Maxwell. A lot of them were none too fond of Maxwell.

This was the first time Maxwell had ever made a mental contact with Earth. He had no wife, and never spoke of his relations. In spaceports and outposts from here to Antares he went off without a backward glance. He did not go roistering with a gang from the ship. He was a lone wolf, drinking where the rest of the crew could not find him. Some of them made wild guesses about his past—about the disappointments and bitterness that must have made him what he was today.

He never gave himself away. He never told them about that woman who had deserted him and left him with a bleak mistrust that hardened into a protective shell. Let them have their silly affairs, let them have their personal calls to their wives and sweethearts: he would let no woman into his life, and certainly not into his mind.

But now, as the ship seemed to recede and he reached out to make contact with the

widow on Earth, he felt a certain mocking interest. He speculated on what kind of woman Wilson might have married. Poor, stupid Wilson, dead because of his own carelessness.

And he wondered, wryly, what sort of reaction she would have to the contents of his own mind—the unremoved memories of cheap women in the frontier towns, the blurred folly of drunken ramblings through the streets of cities on harsh, primitive planets.

Then he was there.



THE room, he saw through her eyes, was simply furnished. It was almost as austere as the cabin of a spaceship. And as he saw this, he was aware of the reasons for it—the reasons leapt up from her mind into his, and he knew that she was having a struggle to go on living, that there were times when there seemed to be no purpose in going on, and yet that she had courage.

He said drily: "Sorry to intrude."

"I am glad to have a visitor."

The answer was shaky but sincere. Her loneliness engulfed him for a second, then she regained control of herself, and he felt himself surrounded by a strange . . . well, what could he call it? He was conscious of her gentleness and seriousness. Of purity.

Purity. Automatically he laughed, and his cynical amusement reverberated through her mind.

She responded: "Why are you so bitter? I thought you were coming just for some technical information."

"Sorry. I'm not used to this sort of thing."

He was uneasy. Although the idea had been merely that he should soak up from her mind the details, meaningless to her, which her husband must unconsciously have implanted there, he realised that she could not help acquiring information from his own mind also. And he was aware of her pity. That angered him. There was no reason why anyone should pity him.

Almost defiantly he let recollections of his crazy behaviour on remote planets froth up to the forefront of

his mind. The back streets of Cassandra City swam up like badly-lit pictures before his eyes—or, rather, before her eyes.

She thought: "What is the point of all that? You got no pleasure from it. What good will so much bitterness and self-contempt do you?"

"Self-contempt?"

"Yes."

She did not make any deliberate effort to offset his thoughts with thoughts of her own, but he acquired from her the sense of her own clarity and cleanliness. He knew suddenly what her life with Wilson had been like; and at once he tried to thrust it away. It was warm and decent, and good . . . and sentimental. He couldn't stand that sort of thing. It was a trap, an illusion. He repudiated it. He wanted no part of that; he denied all knowledge of it, refusing to accept that it could ever be true, that it could ever work out like that.

She questioned: "Have you obtained the information you came for?"

"I don't know. I won't be

able to tell until I get back and set to work. It'll just be a—well, a sort of knack."

"I hope," she thought, simply and genuinely, "that it is all right." There was a pause, then: "How much longer have you got?"

Her head turned towards the clock. He saw more of the room. In her mind he knew the meaning of "home"—and angrily twisted away from it.

"Less than a minute to go."

His irritation made her restless. He could sense it. She rose to her feet from the chair in which she had been seated, and walked across to fiddle with the window curtains. For a moment she pulled them back. Outside it was night. The blackness reflected her face, and he saw the calm, beautiful features. Then the curtain fell across them.

He thanked her. "I'm sure I'll find that I've got what I needed. It was good of you to co-operate."

The room blurred slightly. He was on his way back. As he left her, something that was not a direct thought

plucked at his mind. It was a plea that she could not have brought herself to put consciously into words: "Don't be bitter. Don't try to be unhappy. Don't . . ."



"**G**ot it?" said Masterman.

Maxwell scowled. The cabin seemed oppressive. The vastness of space, in which he had liked to wander, so far from the clutching selfishness of women, became suddenly terrifying.

He shook himself. The residue of that woman's mawkish thoughts clogged his mind—he must make an effort to free himself.

"I think it's all here, sir," he said. "Can't tell until I've got down to the job."

"Go ahead, then."

He took out the circuit diagram of the rectifier, and found that it looked different. It had acquired a new meaning. When he unscrewed the front panel and reached in for a cluster of wires foaming about a terminal, his fingers knew what they were doing. He probed accurately, and knew what he would find even before he reached it.

"This is going to be all right," he said.

Masterman breathed a sigh of relief.

Hardy said: "How long will it take?"

"Twenty minutes, maybe."

"Good. We'll leave you to it. Good work, Maxwell."

He glanced up at Masterman, and found that he was grinning his thanks. He switched the grin off quickly. Patronising swine, Masterman. He was a good captain as captains went, but all that talk of team spirit and the code of the spaceways and all the rest of it . . .

Maxwell worked steadily, without hesitation. And as he did so, he became aware of other knowledge which he possessed.

The repairs to the scrubber weren't everything. He knew far more about the communication equipment itself than he had ever done before. A flicker of a joke went through his mind. It was uncanny—a sort of ghostly echo of a joke that Wilson had once thought of playing but had resisted.

You could fix the controls on that thing. You could switch connections so that when two men were using it at once, as they usually did, in order to make use of the power channel at the same and save power, they could be connected to the wrong receiver—their minds could be joined to the minds of the wrong wives. Maxwell laughed. Let Johnson speak to Mrs. Barrett, and Barrett have a little insight into Mrs. Johnson's mind. That would be quite a riot. They might find that each preferred the other's partner. There would be a fight in the narrow corridors of the ship. A lot of nasty feeling could be caused. Everyone could be mixed up. And Johnson would pick up a lot of information about Barrett that only Mrs. Barrett knew. Useful for one of those slanging matches that sometimes broke out aboard when the men were fed up with the journey and anxious to quarrel for the sake of quarrelling.

It would be terrific.

But he found himself getting up, putting the tools away,

and going to report to Masterman that everything was fixed. The malice that had risen up in his mind was quenched.

Damn that woman. Damn her for her purity and decency, and the strange feelings she had left in his mind. He was being suffocated by her.

THE ship roared in through the solar system. The cities fell away behind. A visit here, a rowdy night there . . . and the memories blotted out in time for the regular calls home.

And as they approached Earth, the talk was all of home. Old loyalties flooded up, and the memories were all of houses and families. The eagerness of approaching the glittering, tawdry pleasures of Cassandra City were as nothing compared with these more lasting yearnings. This was the finest of all planet-falls.

Maxwell could not bear it. All this chatter of women and children sickened him. He had seen these men enjoying themselves, and knew what they were like—how could they

kid themselves that they were real family men at heart, that there was no place like home?

He watched them as they scattered from the ship. Landing formalities over, engines checked, the Customs inspection finished, they were swinging off with their bags of presents, whistling, waving farewells until the next trip.

He watched them. Let them go. He would find the usual hotel and go out for the usual drink. There would be some woman, somewhere. There would be forgetfulness.

The teeming city seemed strangely empty. He did not belong here. He belonged in a heartless, impersonal ship, gladly lonely out among the blazing stars.

No, that wasn't true. He didn't belong there, either. He just didn't belong.

He dredged up from the unknown depths of his mind an address. Then he cursed, and tried to cancel it out. It stayed. It would not be obliterated. Something for which he had not asked—something he had acquired without knowing, without wanting it.

"Cab, sir?"

The helicar swooped, and ticked over gently beside him.

He must have given the address. He spoke the words without meaning to, and then sat back, angry with himself and with all that had happened.

The journey was a short one. They came down in a quiet street on the outskirts of the city—just the sort of deadly, drab, hopeless street in which so many of his colleagues would find themselves this evening.

He got out. There was a strange constriction in his throat. He felt frightened.

The helicar had gone. He rang the doorbell, and in a few moments she was standing there before him. She was more beautiful than he had thought—far more beautiful than he could have guessed from that first brief glimpse in the dark mirror of the window—but it was not her appearance that meant so much to him. He knew so much more than that about her, and it was all clear and bright, and as it should be, so that he felt humble before her.

He said: "I'm——"

"I think I know who you are," she said, quietly. "I'm glad you came. I . . . I rather hoped you would."

They shook hands. It was odd, and absurdly formal, and yet right. There was no pity in her face, and no hint of censure, although she knew so much about him now—knew things he could not hide. But in time she would forget those things. He would prove to her that there was another reality, that there was another Maxwell.

He laughed. He realised that she did not need to have it proved. That, too, she knew.

It would take time before things came right for them. They both had so many adjustments to make, so many things to work out and settle in their own minds. But this was the beginning.

"I tried not to come," he said.

"That was wrong of you."

They both smiled contentedly, knowing that this was the beginning.

HOW WE FIND OUR WAY AROUND

by WALTER GRAHAM

ISUPPOSE THE ART OF Navigation is just about the first thing we begin to learn. Even before we are capable of any kind of movement of ourselves, we establish the location of objects relative to ourselves. Food supply being first and foremost in importance, we might even pin down the reference point more exactly as being the mouth. The thumb goes to the mouth almost as the first expression of humanity—it is the most essentially human of all parts of the body. The great apes make very little use of the thumb. When a baby discovers its toes it puts them in its mouth. Our first toys are really taken into possession and fully apprehended when put to the mouth.

FIXED POINTS

It is not our present purpose to render an account of baby ways, but it is significant that in finding our way anywhere we must start with a reference point, and what better reference point than ourselves?

The first thing to fix, then, is our own location. So long as we are only concerned with getting things to us that is all we need, but as soon as we begin to want to get ourselves somewhere else, reference points are needed. First we must know the distance from us to our objective, then we must know its direction. Direction at once brings in at least one other factor, since direction is a relative term, meaningless unless related to something. Our early nava-

tional problems involve going from our own position to another which we can see with our eyes. There an intuitive assumption that light travels in a straight line gives us our reference. We travel along the line joining our starting point to our destination as defined by the path of light from the objective to ourselves.

WE MAKE A MAP

The next stage is crawling from behind an arm chair to the unseen, but remembered, coal box. Somewhere *en route* there is a table leg as a third fixed point established as an intermediate objective. Gradually a mental picture is built up comprising a number of recognition points and associated directions—that is to say, we make our first map—a mental one.

Later we get into the great outside world and build another map and in time we have a little personal atlas. The house—the garden—the streets near home—the way to Aunt Susan's—Aunt Susan's garden—the school building and playground.

Eventually we make another important step. We learn the conventional signs that other people have created in order to record and explain to each other where things are to be found. The map is a compilation of fixed points, lines of direction and distances. And a map needs orientation. It is useless unless a standard reference, known to all who use it, is in some way related to it. Given that, and the ability to read a map, we are no longer limited to our personal atlas or what we can discover. We have enlarged our ability to find our way around. The experience of thousands of other travellers is now at our disposal.

That standard reference direction, the true North, is the key to all the maps for us. As a small boy I found myself at a little school soon to be destroyed by rebels. The troubles then brewing had left me as the only pupil for three teachers. They decided that I should learn the points of the compass. I was shown the north wall in one room, then taken to the next. Asked for the north wall, I pointed

due south—that is at the same wall I had just been told was the north wall. I was caned by two teachers in each room in the school for my obstinacy before the third and youngest teacher asked me if I knew the north star. The penny dropped. My father had told me all about north, south, east and west with reference to that star. It was that false reference point—the north wall that had bewildered me.

Now for terrestrial navigation. Most of us can manage to get around the countryside afoot or awheel with a map. Even so, at any point in our progress we must know where we are, and if we are in sight of at least two landmarks shown on the map, an estimation of distance and a rough triangulation process identifies our position.

If we are a little more advanced in our use of a map, we may consult a watch, look at the sun and so place our map that we shall need only one landmark. Or, of course, we may carry a pocket compass and use the magnetic north shown on the map. Either way we are using a direction

given to us by the nature of things together with a precision instrument.

Man made a great advance when he learned to find his way about the oceans out of sight of all landmarks. For the purpose he made a grid—a network of numbered lines over the earth's surface. With reference to lines of longitude and lines of latitude, any spot on land or sea can be designated precisely. A ship could be located if its position in the network could be established. Two measurements of the apparent position could do this. Its direction relative to the direction of true north at a given time could give longitude. A chronometer or a wireless signal gives Greenwich time. The elevation of the sun at noon, that is, the maximum elevation of the sun, gives latitude taken in conjunction with the date on the calendar.

Thus clocks, sextants, compasses, tables of magnetic direction, solar tables, etc., are essential equipment.

At night the stars can replace the sun, given the

necessary astronomical data in the form of tables.

PATHFINDING IN SPACE

How will our experiences of earthly navigation make us able to get around in space? The job will not be quite the same as anything we have done before. The three main differences will be these:—

Firstly, we shall be travelling in three dimensions instead of on a surface. Of course, in a sense, an aircraft or a submarine moves in a third dimension, but always within measurable distance of the earth's surface. In other words the pilot of an aircraft is merely going from surface to surface. He can go up to one or down to another. But in space there is neither up nor down.

Secondly, in space there is, as yet, no standard direction with reference to which we can determine other directions. On earth we measure the altitude of the Sun. That is to say, we measure the angle made by two lines. One is the line from us to the Sun, the other is a horizontal line.

In space a line from us to the Sun will not mean much because there will be no horizontal line to use as a reference. On Earth we can use a compass to get a known direction to which we can relate other directions.

Thirdly, in space we shall be travelling at considerable speeds. Even when we know in which direction, we shall not be able to know our speed by any visual methods. There will be no wheels to actuate a speedometer, no air stream to give speed, no knots to count. Thus, even knowing where we are one minute, we shall have no quick way of knowing where we are the next.

SPHERES AND CIRCLES

The three-dimensional nature of space is not, however, a serious problem. The process of triangulation within the solar system will be a matter of solid geometry.

Tables showing the distances between any planet and the Sun, and between any two planets, at any time will be available. We shall need a

standard time, and Greenwich Mean Time would do as well as any. We could use Earth days as a measure of time even in space, where night and day will mean nothing.

Now, from our tables we know at a given time the distance from Mars to Venus, and the distance of each from the Sun. By observation we can get the angle between the line from us to Mars, and the line from us to Venus. This distance and this angle by a piece of simple mathematics tells us that we are somewhere in a certain imaginary sphere in space, and we know exactly which sphere. On Earth we first discover which circle we are on by measuring our latitude. Then we find another circle, longitude, and we know that we must be at the place where the two circles meet. In three dimensional space, we find from Mars and Venus that we are on a sphere. From Mars and the Sun we find we are on another sphere. Two spheres meet in a circle, so now we know we are on a circle. By bringing Venus and the Sun

together in a calculation we can get another sphere, and from three spheres we can get a point. A very small calculation could be made to give the answers in split seconds.

The second problem is to establish a reference point and a reference direction. While we are confined to the solar system, the Sun (assumed to be stationary) is valid as a fixed point. The standard direction will be the line from the Sun to a distant star. But now, since we are in space, we will be dealing in spheres and solid geometry, and so we will want a fixed plane, and that means establishing a line at right angles to the first, also starting from the Sun. Thus it would be useful if we could find two big stars which are so placed that the line from one to the Sun is at right angles to the line from the other to the Sun.

The estimation of speed in space will not be difficult provided we have a good calculating machine to get estimates of our position by the methods indicated. Such a machine would be operated

by three photo-electric cells, one keeping a needle automatically pointed towards the sun, another towards Mars and the third towards Venus.

MATHEMATICS THE PROPHET

Now for quite a long while mathematicians have been using a system of studying curved lines and curved surfaces known as polar coordinate geometry. It locates all things with reference to their direction and distance from a fixed point. Space navigation could well be the justification for many student hours of labour which have so far had comparatively little usefulness.

I will finish by throwing all such probabilities as I have tried to describe onto the ashpit, and leap an unknown number of centuries ahead to a vision rather than to a reasoned scheme of things. Maybe the great vessels that will conquer space will be as unpiloted as a boy's electric

train set. A crew may be packed aboard like so many cocoons. Men in the pupa condition, oblivious of all things, immune to most of man's common ills—cold, hunger or too many G's! Also aboard will be a signal emitter, so that men of many generations may live and die receiving those signals and knowing all their lives exactly where the vessel is in space during its journey through the centuries to some distant galaxy. Instruments on the vessel will respond to signals sent from Earth to reach the destination. Other impulses from earth will cause the chrysalids to crack and men will emerge, fulfil their task of exploration and then again pupate for the long journey home.

But the generations of men at the Earth base control panels will be using their own particular modification of the space chart reference grid that every baby plots with reference to its mouth.

He had to quit his job to get away from the dog which was trying to kill him!

BRUTUS

by GEORGE HOLT

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I DIDN'T GO TO WORK today. I'm not going tomorrow, either, or the next day, or the day after that. In fact I'm not going back to the job at all. I quit.

Why?

Well, I've got my reasons; good ones, too, they seem to me—Madge, that's my wife—she's run out of patience, but then she's a woman and wouldn't understand. Others might not think I'm acting smart either. To hell with them. I know when I'm well off.

I work, worked that is, at the Cybernetics Institute. You know the place? It's that big concrete and glass building

on the edge of town, and I've worked there for the past twenty years as a sort of glorified caretaker and man-of-all-trades. In fact I've worked there so long that the staff have forgotten that I'm just supposed to be the man who fixes the furnace and sweeps the floors. They took to asking me to clean up the labs and, on more than one occasion, they got me to consent to being tested for what they called "reflex index." I didn't mind though. I've always said that just because a man is a caretaker don't mean that he has to be dumb, too, and even though I can't understand all the words they use, yet I've read

a bit and could tell near enough what was going on.

Slats—that's Professor Slat-terly to anyone outside the Institute, though we all called him Slats—he told me once what the project was for.

"You're an intelligent man, Murphy," he said to me one afternoon when I should have been cleaning out the furnace but had sat in on an experiment instead. "In any other sort of social structure you might have been different to what you are. Tell me, why is it that you're just a caretaker?"

"It suits me," I said, though that wasn't the real reason. "The work's easy and I like helping out in the labs."

"That's what I mean," he said. "You should never have been a caretaker. I'll bet that you've never had a proper education."

Well, that was true enough. I'd learned to read and write and cram enough maths in my head so that I wouldn't be short-changed, but that was about all. The rest of what

I knew I'd picked up from books and hanging around the staff with my ears open and my mouth shut. It's surprising what you can learn that way.

Slats nodded when I'd told him.

"I knew it. Now, suppose that there hadn't been any need for caretakers? What then?"

"I'd have starved," I said. "Or taken up labouring and killed myself with heavy work before my time."

He tutted at that and I guessed that I'd said the wrong thing. I tried again. I didn't want to appear too dumb in front of him, and anyway, I had a reputation to live up to.

"I think I see what you mean," I said, slowly. "No caretakers, and that could mean no manual labour at all for anyone. Right?"

"That's it!" He smiled as if I'd just done something wonderful. "If we could eliminate the necessity for manual work then there would be

more time for schooling and education. That means that men like you, Murphy, would be able to study and find your proper niche in life instead of wasting your time sweeping floors."

"It sounds good," I admitted, though I wasn't too happy about it. "But if there were too many professors and scientists, who would pay them?"

"In a well-integrated economy there could be no such thing as 'too many.' Once we lift the burden of manual labour from the shoulders of the masses, then there will be no masses. All men will have equal opportunity for the full development of their natural talents." He coughed. "Of course, not everyone has the scientific bent. Some will become artists, writers, managers, specialists in a hundred different fields, but the main thing is that once we don't have to employ ten men to enable one man to spend his time in constructive thinking, then

we can really begin to progress." He smiled around the instrument-cluttered laboratory. "That, in effect, is what we are trying to do."

I didn't answer at once. Slats was a tall, thin, bent-over man with eyes that peered through glasses as thick as the bottoms of beer bottles and a mouth which, when he wasn't smiling, looked as though he had just tasted something sour. He was clever though, and if the powers that be had had any sense, they would have made him the Head of the Institute instead of Clarkson, a fat-bellied, bald-headed numskull who acted as though he had been directly appointed by God. I didn't like Clarkson.

The reason I didn't answer at once was because I wondered if Slats was trying to get at me. He had a habit of expressing his contempt for the visitors who sometimes came around by blinding them with science. I mean that he'd answer questions with a spate of scientific double-talk which left them staggering and numb.

I didn't think that he'd do that to me, but I wasn't taking any chances, so I tried to think of something really clever to say.

"By cybernetics?"

"Of course. How else can we relieve the world of the crushing labour problem? While we depend on men and the muscles of men to build our economy we will always have strife and misunderstanding. In effect, we are no better than the old Greeks or Romans with their slave culture. We don't own slaves now, but we still confine the working classes by economic chains. Cybernetics will change all that."

I looked over my shoulder, glad to see that we were alone. Personally, I didn't mind what Slats said, but others, Clarkson in particular, would have considered it his duty to report the professor for "foreign sympathies." That bit about the "working classes" had put more than one man on the bread line.

I tried to get him off the subject.

"Do you think that you will ever be able to replace the working man, Prof?"

"We could do it tomorrow," he snapped. "We already know enough about cybernetics to replace half the labour in the world with electronic devices. Take you, for example." He pointed a finger at me as though it were a gun. "What are you? Basically, I mean? A machine, that's what? A well-designed and efficient machine. You rake out furnaces, sweep floors, clean up when necessary, act as a general help and do a dozen and one different jobs during the course of the day."

Again the finger stabbed at me.

"But there isn't anything you do, in a manual way that is, that a machine couldn't do better. The only thing you can do which a machine can't is to think, to reason, to extrapolate. That is the only thing which divides Man from Machine. I . . ."

"Wait a minute, Prof," I interrupted. "Are you telling me that you could build a machine to do my work for me?"

"Yes."

"Then I hope that you won't." I picked up my broom and pretended to sweep the floor. "What would I live on if you did?"

"I've already explained that," he snapped impatiently. "Listen. We could fix a relay to open and close the windows and doors. We already have a thermostat to regulate the air conditioning. We could build a thing to rake out the furnace and another to dispose of the ashes. I've a little device in the cupboard to take care of sweeping the floors, a sort of self-operating vacuum cleaner that I'm saving as insurance in case I get fired. In fact we have everything already built to do anything you can do."

"Then why don't you build it?" I gave up pretending to work and stared at Slats. He shrugged.

"What's the point? If we built it then it would still take a man to operate it. The expense just wouldn't be worth it."

I almost collapsed at that. With relief, you know. I'd had visions of having to go back to real work again, and after twenty years, that wasn't something I looked forward to. The relief didn't last long.

"Once we solve the final problem we will build such an installation." Slats grinned like a madman. "You see, Murphy, the only thing you have which a machine hasn't is an efficient co-ordinating unit with built-in relays and computating equipment. I mean your brain. Once we can rig up something to take the place of that, then cybernetics will be ready to move in."

"Can you?" I was sweating as I asked the question.

"Almost." Slats sighed as if his last moment had come. "You see, we can't build a unit small enough and cheap

enough to be practicable. We need a unit which can recognise a command and act upon it. Something which can anticipate, correlate, and be aware, in a mechanical sense, of course, of the various functions of diverse pieces of equipment. Take you, for example. At this moment you know that the furnace needs attention, the windows will soon have to be closed, the floors need sweeping and the air conditioner checked and regulated. To be aware of all that, and, at the same time, be ready to obey a command if given, takes quite a bit of doing. For a machine, that is. A man can do it on his head, but a machine needs several thousand banks of yes-no relays, plus several thousand more 'memory' banks, plus the activating relays to control the electronic equipment. Think of the variables you ordinarily meet in, say, driving a car, and then try to build a machine to drive a car as well as a man." He shrugged. "You'd need a ten-ton truck

to carry it—and then it wouldn't be as efficient as a man."

I nodded. None of this was really new to me, but Slats had clarified the "robot" problem quite a bit. I frowned over it, half-afraid to ask a question in case I should be thought dumb. Still, you don't learn anything if you don't ask, and a caretaker wasn't supposed to be intelligent, anyway.

"Suppose you used the brain from a man? I mean suppose you took a living brain and hooked it onto your equipment, would it work?"

"It might," said Slats, seriously, and to my relief he didn't laugh. "I suppose that we could keep it alive by pumping oxygenated blood and nutrients through it. It certainly contains enough cells and yes-no relays for what we need." He nodded as if the thought were new to him. "It probably would at that."

Clarkson came in then and I got busy sweeping the floor.

I'VE told you about Clarkson. I didn't like him, and as far as I knew, he didn't like me. He had a dog, a huge Great Dane, and if there's anything in the theory that an animal takes on the characteristics of its master, then Clarkson must have been a swine. Brutus—that's what he called the beast—seemed to know that his master was the boss and took a perverse delight in throwing his weight around. He was intelligent, too, intelligent enough to know when I'd just cleaned the floors so that he could track his big muddy feet all over them.

One time we really fell out. Brutus had christened the jamb of the furnace room door, the way dogs will do, you know, and I almost stove his ribs in with the head of my broom in order to teach him not to do it again. Brutus didn't like that. He was a big dog as I've told you, and he went for me.

I managed to let out a shriek as I went down, and I had the sense to shove my

left arm into his mouth. He tore the sleeve pretty badly before Clarkson came and ordered him off, but he'd been crafty enough not to break the skin. Clarkson wanted to fire me for, as he called it, antagonising the animal, but after I'd shown him the trade-mark and pointed out that I wasn't employed as a kennel maid, he calmed down.

I managed to get my own back on the dog a time or two, but I was never really happy when the brute was around. He had a way of looking at me and showing his teeth, and twice I had a ripped trouser seat, once after giving him some meat loaded with cascara, and again after spiking his drinking water with alum. That dog was intelligent.

I didn't like Brutus.

Even though I didn't like him, yet I felt sorry for him when, one evening, he crawled into the Institute more dead than alive. He'd been in an accident, probably tried to

bite the wheel off a car or something. Anyway, his back was broken and his ribs pretty well crushed. I picked him up—it wasn't easy, the beast weighed almost as much as a man—and carried him up to the lab. Even then he wasn't grateful and managed to take a bit out of the lobe of my ear on the way. Slats was in and I dumped Brutus on the bench.

"It's Brutus," I said. "Clarkson's dog. Can you do anything for him?"

Slats puttered around a while then shook his head.

"Nothing I can do."

"Then maybe I'd better call the vet." I moved towards the door and was almost outside the lab when Slats called to me. He seemed excited, and it wasn't until I'd shut the door that he told me what was on his mind.

"Murphy! You remember me telling you about our problem? The one about not being able to build a unit small enough to control the

electronic equipment in this building?"

I nodded. I remembered well enough, though our talk had happened weeks ago. I knew, too, that Slats and his assistants had been rigging the place up with all manner of devices designed to do my work. It had worried me for a while, but when I'd noticed that they didn't want Clarkson to catch onto what they were doing, I'd calmed down.

"I remember. What of it?"

"You suggesting using a man's brain. That is impossible, of course; we can't do that." There was pure regret in his voice. "But supposing we try that of a dog?" He looked down at the helpless animal. "Is Clarkson in?"

"No." I knew that because I'd seen him go out.

"Good." Slats rubbed his hands. "Look. We've chloroform in here; we use it for the rabbits, and I can put the animal out of its misery. The head could be put in the

deep-freeze until we're ready for it." He looked at me. "Can you take care of the body?"

I don't know what came into me then. Maybe it was because I knew that Clarkson would blame me for the death of his dog anyway—he was like that. Maybe it was because I didn't want to offend Slats and have no friends at all to stand by me when Clarkson wanted to fire me, which he did about every six weeks. Or maybe it was because of the streak of the pure scientist in me, the same thing which had made me take the job at the Institute in the first place. Whatever it was, I nodded—and we set to work.

I don't like to think about what happened then. I helped Slats to administer the chloroform and I'll never forget the look in Brutus's eyes as I held his head. If anyone ever tells you that an eye can't hold expression, take it from me that they don't know what

they're talking about. That dog *knew*, and the way it looked at me brings me out in a cold sweat even now.

Slats took care of the amputation, decapitation rather, and I had the unpleasant job of disposing of the corpse. I put it in the furnace, building up the fire until all the evidence had vanished, raking out the ashes and breaking up the bones, all the time in a frenzy in case Clarkson should walk in and see what I was doing. He didn't, though. He posted a reward for the missing Brutus, and for a time looked almost human from grief and loss. I suppose each of us has a soft spot somewhere, and that dog must have been his. If Brutus hadn't been as good as dead anyway I'd have felt a lot worse about the entire thing.

Several days later Slats handed me a package and told me to burn it. I didn't look inside, but I could guess what it was. He didn't want

the entire head, only the brain, and I knew that the experiment had neared completion.

It had, too.

At first it was wonderful. I still clocked in and out, and drew my wages, but that's literally all I had to do. Aside from dodging Clarkson, of course, but I'd always had to do that. The rest of the time I hid or hung around the laboratory, staring at the small black box which controlled all the machines which were doing the work I was paid for doing. I had been right about Brutus; he had been very intelligent, though Slats said that it didn't matter at all. He said that all he had wanted was the brain cells to use as a compact computating unit. He said that, as far as the dog itself was concerned, it had ceased to exist, and that the brain

was really nothing more than a mass of relays and neuron paths. He said that it was just like a mammoth radio with no more intelligence or awareness of individuality than any other radio set.

He said a lot of things—but I didn't believe them.

And why?

Three times after the first week I almost lost my hand in a slamming window. Twice the furnace door swung open and seared the seat of my pants. Four times I got locked in the building after hours, and once I almost got electrocuted while taking a bath.

So now you know why I've quit. As far as I'm concerned the Cybernetics Institute is wholly run and managed by a dog, Brutus.

I don't like Brutus, and Brutus—he don't like me.

Now do you understand?

Here are reasons why we
shouldn't

Stand on our Feet

by PETER SUMMERS

WHEN PRIMITIVE MAN CAME down from the trees, he undoubtedly did a wise thing. But when he reared up on his hind legs he started something that has been causing trouble ever since. Mammals, the class of creatures to which man belongs, have unquestionably evolved from fish-like ancestors through amphibia and reptiles. It is the fish pattern of body organisation which has set the standard for all succeeding groups. Fish are designed to move horizontally, and so are the higher groups. Man is the only creature who goes against this design—for even the bipedal birds do not, strictly, move vertically.

As anyone who has cleaned a fish knows, the major organs of the body are slung by sheets of thin tissue—the mesenteries—from the long

pole of the vertebral column. They hang freely and without anything pressing on them. This condition is found in all the lower animals from fish up. But not in man. Man's internal organs, especially those in the abdomen, are piled up on top of each other, so that there is an increasing pressure from the uppermost downwards, until at the base of the abdomen the poor organs are squashed tight.

When you remember that the intestine cannot do its job properly unless it can undergo constant rhythmic movements (peristalsis), it is not surprising that man is heir to so many intestinal diseases such as ulcers, cancer or even the mild but prevalent and annoying condition of indigestion. By walking about on our feet instead of our feet and *hands*, we prevent the

intestines having sufficient freedom for their natural movements.

Even more trouble is caused by the gravitational strains on the heart, liver and kidneys. In the lower animals these hang snugly just below the vertebral column; in us they lie in *front* of the vertebral column, and if we don't have sufficient fat to pack around them they swing about in a manner which does them and us no good. Due to this, perhaps, more than to any other cause, arise our heart, liver and kidney diseases. Several heart specialists have stated that, in their opinion, fully half the incidence of heart disease would disappear if man crawled about on hands and knees. The loss of dignity seems too great a price to pay!

Again, no one can be proud of the sloppy way in which women have their babies. In the lower animals the birth of young is a simple, natural event on practically all occasions; there is no fuss, bother nor danger. Yet in women this perfectly natural affair has come to be regarded

as one of the most critical times in a woman's life, and it is attended by all manner of precautions and elaborate preparations. True, obstetricians believe that the psychological attitude of the woman plays a big part in making her have a difficult delivery, but it is also conceded that many of the childbirth troubles that are definitely *not* psychological may well be due to the enormous pressure of the abdominal organs on the womb, and of the womb on the lower organs. Certainly, the "milk leg" of pregnancy is undoubtedly caused by this pressure acting on the veins supplying the legs—crushing them flat and preventing the return of blood to the heart.

The circulation is affected by the upright posture in other ways. We must bear in mind that in the lower animals the heart does not have to overcome much gravitational force, for the main vessels are horizontal and the only force against which the heart has to work is the friction of the blood against the vessel walls. In man *all* the main vessels are vertical. The hu-

man heart has to fight gravity to get blood into the head and brain; and it has to fight gravity to get the blood back from lower parts of the body.

Actually, even a strong heart is incapable of forcing blood up the legs sufficiently fast to keep up the circulation. You see the proof of this every time a soldier faints on parade. In order that our circulations shall stay efficient we must keep bending our legs. When we do this, the limb muscles squeeze the veins, and since the valves in these vessels prevent blood moving backwards, the blood is forced on to the heart. In the absence of this "muscle pump" (for example, when on parade for a long time) the blood stagnates in the leg veins and too little returns to the heart for it to be able to keep up the supply to the brain. Then we faint.

When people stand for long periods every day—but not long enough to cause fainting—the continual partial stagnation of the blood in the leg veins causes, after several years, perhaps, varicose veins. Man may be master of the

world, but he cannot go to sleep standing up, as sheep, cows and horses do; he would faint in his sleep!

But perhaps the worst effects of our upright posture are found in connection with the skeleton, which has undergone profound distortion compared with that of the lower animals.

In the lower animals and in very young humans—up to about three and a half months—the spine consists of a single, gentle curve from front to back. When the human baby begins to crawl about and begins to totter, the spine acquires a second curve, forwards in the neck region. When the human baby really stands up and starts to walk, a third curve, forward in the abdominal region, appears. The spine keeps that shape for most of our lives. Notice what has happened. In place of the single, sweeping curve of the lower animals, we have now got three curves making a sort of large "S." While all this bending about has been going on, the actual vertebræ—the separate spine bones—have not greatly changed from the pattern found in a

rabbit or dog. But that pattern was evolved to give maximum efficiency with a horizontal, "C"-curved spine. Ordinary common sense can see that this vertebral pattern will be inefficient with a vertical, "S"-curved spine.

If you doubt it, ask anyone who has suffered from a slipped disc! This extremely painful condition is directly due to the upright posture. Each vertebra bone is separated from its neighbours by a disc of cartilage. These discs, present in very thin pieces in the lower animals, were evolved merely to effect a slight separation of the vertebrae, so that they wouldn't grind upon each other when the animal moved. But in man the lower discs are taking a great deal of the whole weight of the body. Each time we move, we grind our discs down a little. So do the lower animals. But the lower animals do not grind them *as much* with each movement and the discs comfortably last out the animal's lifetime.

In man, however, the intervertebral discs are subject to

so much wear that they frequently get worn very thin towards the end of a long life. Sudden or forced movements often push the discs out of place. The slipped disc presses on the nerve that leaves the spinal cord nearby and creates almost unbearable pain.

More mild but more prevalent is the ache in the lower back caused by this continuous day-long grinding of the cartilaginous discs. Often it becomes chronic and the person is never without an aching back—due to the fact that he stood up when he was twelve months old and never went back to crawling!

Another part of the skeleton that leads a sad life is the knee. Here again it is a matter of grinding cartilage—the cartilage that occurs at each end of all long bones. Lower animals distribute their weight over *four* joints halfway down their limbs; we use only *two*. And, as with the intervertebral discs, the lower animals grind their joint cartilages so little that they always last a normal lifetime. But in man, each cartilage has relatively twice

as much weight to bear and receives about twice as much wear. It is not surprising that about halfway through our lifetime, the knee cartilage frequently wears out. When this happens, the ends of the bones start to grow again, but they grow irregularly, into ridges and bumps. These bony ridges grinding against each other with every step cause arthritis of the knee—a condition that can also be caused by other things.

Lower down, the foot bones also have to take relatively twice as much weight as they take in the lower animals. The little bone behind the great toe has to support half the body's weight with each step we take. The other half of the body's weight is distributed throughout the other bones, but all of them take a beating. The tremendous forces continually applied to these bones as a result of the upright posture causes flat feet and a whole host of other

painful and crippling conditions.

It is not only the fact that we walk about upright that causes all these troubles. Another important factor is that we so often *stand up suddenly*. If you've ever watched a cow or a horse get up from a lying down position, you must have noticed how slow and clumsy is the operation. Slow and clumsy it may be, but it's easy on the poor old feet! Humans often rise to standing from a sitting or lying position many times a day. They do it smoothly and quickly. But every time, the load on their bones, heart, liver, etc., jumps from near zero to a maximum in a split second. This constant "hammering" effect has cumulative results—a gradually increasing predisposition towards aching backs, painful knees, failing hearts, floating kidneys and all the other complaints that are the price we have to pay for standing on our feet.

Sometimes, a scientist's dreams may
become nightmares

Symbiosis

by GEORGE C. DUNCAN

JOHN MONTAGUE WAS A botanist, and it was with a sigh that he put on his overcoat, looked quickly round the lab and switched off the lights. He was tired and late, later than he had planned, for in a way he had something to look forward to on this particular night, and he was keen to get home. He drove his car out of the garage and home through the heavy rain.

He stopped to buy his usual evening paper from the boy on the corner.

"Good evening, Mr. Montague." The greeting was the same every night, and every night John responded in the same words.

"Good evening, Peter. How are you?"

"Can't complain, guv'nor. Can't complain."

Then John would get back into his car while Peter would explain to his latest friend. "Nice gentleman, Mr. Montague. Lives in that big house down at the Common. The one with the glass-house at the back that looks like a bit of Kew Gardens. Does Botany."

"What's Botany?" his friend would be almost certain to enquire.

"Grows plants and things. Like a gardener, but more so."

Peter would be satisfied with his explanation and his friend would relapse into silence quite content. They would draw back into the shadows and wrap their coats round their unshaven chins

and curse the weather. And that was the way of it on the night that George Burnett arrived to see his friend Montague.

John's house was one of those old Victorian places with a high wall round it, and over the top of the wall at the back you could get a glimpse of glass and white-painted wood which was the top of his "Crystal Palace." It was the excuse that John always put forward when he was asked why he, a bachelor, should want such a great place to himself. Of course there was Rayson, who had been with John for years, and who looked after him, the house and the Crystal Palace.

"Good evening, sir," Rayson greeted him in the hall. He took his master's coat and noticed that the corners of his master's lips were inclined to droop. "I have put a little hot whisky in the den," he went on, "and there is a Mr. Burnett waiting to see you." Rayson took the coat and scarf which John gave

him and then disappeared in the direction of the kitchen, to produce, a little later, an excellent meal.

During the meal the two friends exchanged their news, and afterwards, with pipes glowing and sighs of appreciation at Rayson's efforts, they settled in the den.

John stretched his corduroy-clad legs to the fire and blew smoke to the ceiling.

"I'm very content here. Not that I should have that outlook. Entirely wrong, as old Physis would say. He doesn't believe in contentment. For a botanist I have never met a man so discontented."

"Who's Physis?" asked Burnett with interest.

"Just another research man, but he looks as old as the hills and has a hundred different theories about plants. He thinks the vegetable kingdom will revolt against man one day and refuse to be pushed about, eaten, cultivated, mutated and experimented with any longer."

"Well, it's an original idea,"

George responded. "But what does he base his theory on? And he surely doesn't expect us to believe that one day we'll see neat little paragraphs in the papers about gardeners being 'cowed by cabbages'."

They both laughed at the idea, but John went on more seriously: "No, I don't think Chlorella Physis has ever thought of bizarre beetroots. His theories are much more profound. In fact, he is doing research on this notion. It started a few years ago when it occurred to him that the power of adaptation in the plant kingdom is beyond anything we know in the animal world. Contrast the habitat of the cactus and any common marsh plant. Or if you like, consider the half a hundred plant species which are capable of withstanding extreme cold, then compare them with tropical plants adapted to the high temperature common to their habitat."

"Agreed," George answered. "If I understand cor-

rectly, the theory is that there may be an attempt by plant life to produce a new species capable of repelling man, or even co-operating with human life in a kind of symbiosis. Each species contributing something to the life and well-being of the other."

John nodded and knocked his pipe out on the side of the hearth. It was clear from his manner that his mind was dwelling on other things. "I liked his theory. I haven't told him or any other human soul, but I have been experimenting along those lines, using plant hormones for speed and adaptation."

"Not really?" said George, sitting up to hear more.

"Look here," John continued, "let's go out to the Crystal Palace and I can show you the work up to date. There's heat and light out there, and I think you will find it worth your while."

The library led off the den and a small corridor took them into the place

where John spent almost all his spare time. Rayson was working in one corner of the vast glasshouse, where an incubator was humming. An enormous refrigerator occupied another corner. The work bench was backed by shelves containing rows of chemicals in bottles, and beside this was a desk littered with paper about to overflow on open notebooks containing details of current work. "This is the place where all the real work is done." John introduced his laboratory proudly. "The smaller cupboard over there contains the phase contrast microscope and the microtome, along with the balance of essentials. Down the end here—" John took his friend into a smaller house "—I have the stages through which we have developed."

George looked at the neatly tagged and carefully tended growths in the boxes. Then with some surprise he noticed a healthy specimen of *Mimosa pudica*, the sensitive plant.

"Is this included in your work?" he queried.

His surprise was evident, and it made John laugh when he replied: "Why, yes. You see I'm trying to take on the job of working out the ingredients of the co-operating plant. At least, that is a rough name for it. I want one which will give copious supplies of a honey type of food and I have an idea it may be useful if it can move so that the clumsiest of human partners will not damage it. Using plant hormones I have discovered, I have been able to alter chromosome numbers so that the question of including the properties of as many plants as possible has been overcome."

George was still trying to orientate the information he had been given. "How big will this thing be?" he asked. A frown furrowed his forehead. "Something about the size of an aspidistra or a tree?"

John laughed again, delighted to discuss the theories

he had held to himself for so long. "We'll have to wait and see. The plan is that when I have the final new species I will produce a giant model and grow it right in the middle of the Crystal Palace here. It will have a fine perfume, very large flowers, a hardy constitution and will flower all the year round. As for the human part of the symbiosis, I am taking advantage of the normal pollination procedures but substituting a man for the flies, moths, bees and wind which nature normally uses."

"Well, it all sounds very marvellous and I wish you success, but look here, I'm at a loose end—" George paused for the briefest of seconds, then continued, as though he had made his mind up: "Could I join you? What I mean is, I have a good botanical knowledge and if you are willing to let me stay here, I could assist." Again he broke off as his eye caught sight of more specimens.

"What's this *Dionoea*, *Utricularia* and *Nepenthes*—all the insect-catching plants? You've included them in your experiments?"

"Your catching on quickly, George. I thought for a long time before including them. All of them get their nitrogen not from the soil but from catching and digesting insects. Then they have well developed 'motor' cells, and for various reasons I included them with the intention that if conditions grew difficult for the plant it could always feed itself from the insects it could catch. Though the whole arrangement is secondary to feeding itself through the roots. Now I would be delighted to have a collaborator and helper on this idea, and as for living here—there are half a dozen rooms upstairs you can choose from."



That was how the partnership was formed, and George, already attracted by the scope of John's ideas, found himself

thinking in terms of plant architecture.

The early work had taken several years to accomplish, but the extra helper meant that experimental work was increased and the new plant species, each carrying a little of the original forebears, began to accumulate in their own special corner of the Crystal Palace. John was concerned with so many projects that he congratulated himself upon many occasions when he had to leave the work to George while he was at research conferences. He knew that things were going on smoothly and Rayson had developed into a first class technician, which made them into an effective research team.

A total of over fifty new species had to be synthesised into one final plant which would carry all the necessary qualities for the first human-plant symbiosis. It was here that George began to have his doubts about their work. He mentioned it one night at dinner.

"You know, John, I've come across some peculiar things about these last few pollinations. When I left 782 and 789 on the bench near one another this afternoon I found after about five minutes that they had pollinated each other. I thought we had found some new things, but this is the first time that I have seen motor cells reach out for pollination."

"Are you sure?" John asked. "You didn't imagine it? You didn't go away and then come back and think it happened? Maybe Rayson moved them?"

"I didn't leave them for a second, and the movement occurred in front of my eyes. I was so fascinated that it wasn't until afterwards I thought of the camera."

George was distressed, but John suddenly whooped with joy. "Don't you see? We are getting closer with every pollination and it had to be the motor cells which would show us the thing is going along the right track"

"But these movements were steady and easily seen," George argued. "Are we sure we have not included too much of these insect catching genes? The final product will be no good if it's continually waving about or swinging branches when its co-operator is with it."

He stopped speaking because his next words almost carried a sense of insanity with them.

"Then there appears to be an intelligence at work among these specimens. I'm looking after this last batch myself because they are important. Have you ever had the feeling that someone is looking at you when there is nobody about?"

"Everybody has had that sensation," John replied. "Look here, George, are you trying to tell me that these plants are looking at you? Why don't you take it easy for a spell? Let Rayson carry on while you get away for a few days. After all, you

have been at it for a long time now . . ."

"No. Don't be ridiculous. I have had this sensation and I keep looking round. Over my shoulder sort of thing. Of course there is no one there. It has been happening for the last few days. Then I wondered about the plants, and when I was down there with them today I felt the sensation coming on again. I just decided it was the plants looking at me."

"It went away, then?" John asked.

"That's the eerie thing about it. The feeling disappeared immediately and that scared me more than anything else. In fact I was downright frightened, and I ran out of the lab and made some excuse to Rayson that I wanted to go for a walk."

"Take a hold of yourself, George. We know the theory behind every step in this process. The next batch are the attracting plants. If you like, you carry on with them.

I'll finish off the ones with the motor cells."

John didn't tell his friend of the sensations he experienced while he finished the work on the specimens which would introduce movement to the final synthesis. He told himself that he must be objective and scientific. He wondered if it was auto-suggestion or if he suffered from an unusual form of extra-sensory-perception. His arguments and explanations to himself were all unsatisfactory. Every one was broken when he found that by the mere recognition of the collected plants as an entity the feelings disappeared.

The next twelve months saw the end to the mere mixing of genes, chromosomes and species. The final plant would be a shrub with dark green and fleshy leaves, not far removed from those of the cactus but without its spines. The flowers would be not unlike those of a lily, and the fruits would be large and highly nutritious. The

pollen sacs of the flowers would rest inside the top of the largest petal and be easy to get at, but the stigma would be deep in the flower, surrounded with large honey sacs which would be the plant's contribution to the human partner.



The dark brown pea-sized seeds lay on the bench and the three men hung over them. The result of years of effort.

"I think we will go straight to the tree product and not wait to produce the shrub," John said.

"Why not wait and let the shrub develop before reaching too far ahead? It will give us a chance to get to know it before we are faced with something we can't control," George suggested.

"Oh, no, we needn't worry about the question of control," John broke in. "Every step has worked out ideally according to the theory. If we are right, as I

am sure we are, we can offer this to the world as the answer to starvation and food shortage."

"Do you mean we grow a few million of these and spread them round the world?" asked Rayson, shaken out of his usual taciturnity by the significance of the work with which he had been helping for so long. "I didn't know we were doing anything like that. Is everybody to have one?"

"Why, yes, Rayson. We only have two seeds this time and you can have one of those. You deserve the first. You've worked hard to bring them into existence and I think it is right that you should have the first. Don't you agree, George?"

George looked at the wondering Rayson with a smile. "I do agree. He deserves the very first."

Rayson grew red in the face with these compliments, but after some hesitation he answered: "I know you mean

to be generous, gentlemen, but I don't like the idea of a plant being so chummy with me that we can't get on without each other . . ." Rayson looked at them with an unexpressed distaste in his eyes. "It doesn't seem natural."

"I wonder," John commented when Rayson had scuttled off full of embarrassment, "if we have heard an echo of the voice of the man in the street?"

The subject was not mentioned again, but the seeds which had lain on the bench were treated to increase their chromosome number and so produce trees or at least large bushes.

The central area of the Crystal Palace had long been kept for the final product and it became the interest point for the household. Each morning, before they were dressed, it became the custom to visit the "Palace." They would stand around this one patch of innocent earth and speculate upon how long it

would be before the first shoots would show their leaves. Time passed and the seeds germinated, shot their tender, fleshy leaves a few inches into the air and started to grow with almost feverish speed.

To John's annoyance his own work began to take him away from his home. A series of research conferences had been organised to cover the next few years. It was a new idea in progressive and co-operative research which had been suggested as a more efficient method of clearing some interesting problems which the botanical world found engrossing. He wanted his laboratory to be included, and he found himself working with divided loyalties.

George and Rayson sympathised with him at this time and did their best whenever he was away to send him full details of the progress of the plants.

"They are seven feet tall and appear to be keeping pace with one another," George

wrote on one occasion. "The leaves are difficult to describe. They combine the fleshiness of the cactus with the delicacy of the palm frond, though how they do it I cannot tell. These leaves are long and they also seem to know us. At first they curled away or lifted to let us pass, but when I went into the Crystal Palace the other morning the strangest thing was happening. Rayson was standing beside one of them, with a queer expression on his face. At first I did not understand, then I saw one of the leaves was 'caressing' him. I don't know if this is the sort of thing we want, but we have the oddest plants that man has ever conceived. We are looking forward to seeing you soon and hope you are fit. Rayson and I are putting on some weight and I noticed the other day that my hair is not so grey as it was. I'm probably imagining things, but I feel younger since the plants have come."

There was a great deal

more in the letter, and all of it was centred round the blooms reaching towards the roof of the Crystal Palace.

John was delighted with these letters and read them over several times so that he could visualise progress. "Fancy old Rayson falling for this leaf and letting it stroke him." He was conscious of a shiver which stood his hair on end.

He arrived home just in time to watch the first buds starting to form. The excitement was vibrating in every corner of the old house. George met him at the door, looking years younger, and Rayson had found he possessed a tongue with the accumulated thoughts of years to express.

John marvelled at the beauty of the blooms. They were slow-growing and possessed a fascination which was emphasised by the gradual revealing colours and shapes which they assumed in their growth. He spent every minute of his time with

them, soaking himself in the perfume which surrounded the plants, finding fascination in the curve of the stems and new delights in the caressing of the leaves. He played with the names he hoped would express their properties. Esoteric names capable of implying all the delights which his own senses registered. He failed utterly, and decided to wait until the food flowers had developed to their maximum and then he might find the word. There was, he admitted, something peculiar in the erotic lure the plants stimulated in the human mind. He threw the thought off. The design was right, of that he was certain, and if it failed to attract, then he had failed. It was a good criterion.

"Wonderful things," George would say. "I never knew there was so much beauty in the world. It's a kind of distillation of wonders. Look at the colour just showing in these buds. Did you ever see such pink?"

How it merges into delicate blues and greens!"

"It's the leaves which I find wonderful," Rayson would interrupt. "They seem to think. This morning when I wanted to pour some water round the roots the leaves lifted to let me in. When I stood back and looked up they caressed me. Almost as though I was being thanked. Can they think?"

"No they can't, but they can respond to stimuli." John answered the question for the hundredth time. "From my notes and the speed at which the buds are developing, it seems that the final maturity will occur while I am away. The flowers will last a long time, so I will see them eventually, but it is unfortunate that at the vital moment I have to go off to discuss pond weed at a conference."

"By the way, John, you remember this idea was one which Chlorella Physis envisaged?" George said. "Have you told him about these?"

"Not yet. I hope to ask him down here so that he can see for himself. I will be seeing him at either this conference or the next, and then I will bring him along. I think he will get excited, which is something for him, and will be something for me to look forward to."

Before the buds had developed John had to leave. He had never before experienced such a loathing to leave the house, though later he admitted that the plants were responsible for his tardiness.

The conference dragged on, and he found himself with drooping spirits. Maybe he was run down, or there may have been all kinds of reasons for his lack of interest. He did not receive his usual bulletins about the development of the flowers, and then Chlorella Physis was not at the meeting, so his news about the symbiotic plants had to be kept to himself. He returned with the knowledge that the conference

was to be resumed in another four days.

"John, my dear fellow, you look ill," were the first words he heard as he walked in the front door. "He does, doesn't he?" George turned to Rayson for confirmation.

"You look terrible, Mr. Montague," Rayson agreed.

In spite of his protestations, he found himself hustled up to his bedroom and put into bed. Maybe he was ill and his friends were doing the right thing. They were so grimly determined that he should do as they ordered. Then they both looked different. They were full of confidence and assured of themselves. They both looked younger, probably because they were fit and he was so tired and depressed.

During the night he discovered that his door was locked. He had decided to steal down to the Crystal Palace and see his plants and the blooms, which must be at their best by now. He

went back to bed and slept, troubled by dreams and vague feelings of disaster.

In four days he left his room, only to be escorted to the station and safely put on the train. Every effort to see the flowers had failed. They had gently, but firmly, over-ridden him. He almost felt their sigh of relief as the train started to move, yet all the time they kept up the farce of small talk and regretful goodbyes. He did consider sneaking back to see what happened while he was away, but there was the repugnance of spying on his friends. Not that he would be away for long this time, and he might be able to bring old Physis back with him. In this way he consoled himself, though the whole affair was disturbing.

More pond weeds for discussion, and then the joy of seeing Physis. They met in his hotel bedroom where they would be free to talk without interruption.

"Tell me, Chlorella," John

asked, "you remember that idea of a plant-human symbiosis that you once mentioned. Did you ever try to bring it to fruition?"

The old man's eyes lighted up at the remembrance. It was only when he lifted the stooping head that one could see his eyes and his cheery red face. He sat back in his chair and wriggled deeper into the large untidy tweed suit which he always wore. "I gave that idea up." He folded his hands in front of his chest. "It may be the foible of an old man, but I decided it was too dangerous." He went on with his words and thoughts, not noticing that his first few words had almost acted as an electric shock on his listener. "You think about it, my friend. The situation of man as the superior animal or species on this wonderful little world of ours. He has been developing along well-defined lines for thousands of years. Nothing has been able to stand against him. The lesser ani-

mals have been pushed into reserves or developed for food. The plants are in the same position. A few have actually had properties which could enslave the all powerful man. Tobacco, our old friend *Nicotiana*, has been able to get a grip on man. Then there is the opium poppy and hashish, and the more recent mescalin, all capable of enslaving the human race and destroying it if efforts had not been made to protect man against himself and the plants. That is why I did not go ahead with my idea. If I developed a new species from the old, and took only the harmless plants to make it, some of the venom from a million years of the struggle for existence would still be there."

"You maintain, therefore, that we would be unable to control this thing?" John asked.

"Man has controlled all his discoveries, but has never controlled himself. Some day, someone will produce this

symbiotic plant, but the consequence in human misery may be awful to contemplate."

Chlorella Physis wagged his finger as he made his point. The action had caused him to look at John's white face and the haggerd expression which had stolen over it.

"But I've done it." John mouthed the words. "I have produced two and they are growing in my own home at this very moment. I have two friends who have been helping me and they have suddenly started to act queer—"

"You've done it? You've produced symbiotic plants? You have friends in the same house with them? Alone with them and without your skill and knowledge to protect them? We must go immediately. You can tell me what you put into these things on the way."

Chlorella Physis struggled out of his chair, and it was his urgency which took them out of the hotel within

minutes, into a car for the journey back to the contents of the Crystal Palace.



Of course no one ever guessed why John went mad. It was the scene in the glass house when they walked in. Physis insisted that he would go first. The tall plants, with their leaves waving almost rhythmically and their enormous bell-lily shaped flowers, nearly ten feet long. Then the large red petals like steel clamps fastened on the bodies of two men. They had been feeding from the flowers and, like insects, had crawled into the blossoms to get to the honey sacs. They had done it before, but this time they had changed places and it was this time that they fulfilled the plant symbiosis—they had carried pollen on their clothes. Then the primed motor cells had acted and the petals had locked them in a deadly, erotic embrace.

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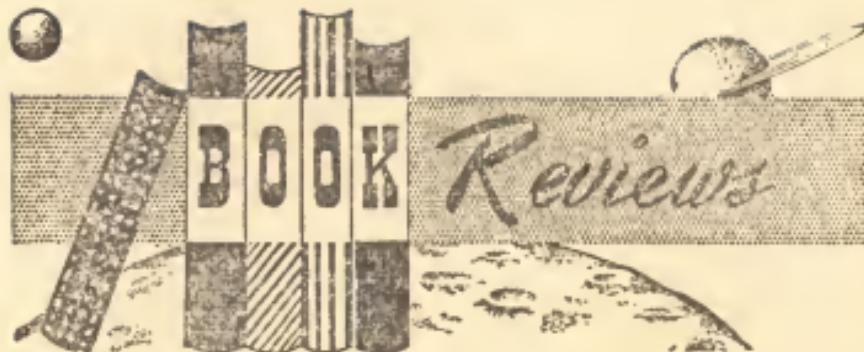
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NON-FICTION

FIELD AND FOREST, by Islay Manley, is an admirable book, and would be just the thing for anyone who thinks plants are merely *plants*. The author goes into detail—just enough detail—about the more usual flowering plants and also the less well-known ferns, lichens, conifers, fungi, liverworts, etc. The illustrations are good and the paper is nice. There are two indices—one general and one of plants—and a glossary. We think the language used is a little *too* poetic: it is practically all we would quarrel with. The book is published by Batchworth Press Ltd., 54 Bloomsbury Street, W.C.1, at 16s.

Those of you who have seen Walt Disney's film **THE LIVING DESERT** will know

what a successful and beautiful film it was. Now we have a book based on the film, about the lesser known desert animals and their lives. There are very many photographs, all in colour, and quite a few drawings. The wording is an augmentation of the narrative in the film, and reads very nicely. At the end we have various lists of animal and desert terms, desert characters and plants, and an index. Well worth the 8s. 6d. charged by Rathbone Books, Adprint House, 51a Rathbone Place, W.1. We look forward to others by the same author.

Patrick Moore's **GUIDE TO THE PLANETS** is a companion volume to his *Guide to the Moon*. It seems of special interest to amateur astronomers as it contains an appendix which gives particu-

lars of using a telescope, together with a mention of astronomical societies and literature. Moore has several diagrams where he compares planets, etc., with places on the earth. (e.g., Phobos and Diemos are drawn onto the Isle of Man). The book includes several of Moore's own drawings. Starting with an account of the birth and movement of the planets, the book goes on to deal with each planet separately in considerable detail, finishing with a couple of chapters on space travel. A number of coloured illustrations make the book very acceptable. It is published by Eyre and Spottiswoode, 15 Bedford Street, W.C.2 at 21s.

PRACTICAL MATHEMATICS for students of science and engineering is a preparatory course that will be found most useful by all who wish to brush up their elementary figuring. Written by C. C. T. Baker and published by English Universities Press (St. Paul's House, Warwick Square, London, E.C.4) at 7s. 6d., the book covers a great range of simple mathe-

matical operations and applications, with a wealth of worked examples and exercises. (Answers are at the end of the book.) Extremely well written, it should go a long way to overcoming the common fear of mathematics. Highly recommended.

Another mathematical book, in lighter vein, is **NUMBERS, FUN AND FACTS** by J. Newton Friend. Without doubt this is one of the nicest introductions to mathematics there is. Interesting information on the historical origin and application of numbers is cleverly interwoven with intriguing accounts of special properties of various numbers, leading gently through a subtle instruction in fundamental mathematical concepts. This is a book that even the most unmathematical-minded person will enjoy. Plenty of "puzzles" give the book a very practical appeal. Finally, the book is laid out and printed in such a modern, sophisticated style that all resemblance to the usual maths textbook disappears. Very good value, and an intellectual treat, from Charles

Scribner's (23 Bedford Square, London, W.C.1) at 12s. 6d.

SCIENCE AND ITS BACKGROUND by H. D. Anthony, M.A., B.Sc., Ph.D., F.R.A.S., first came out in 1948 and the demand has been so great that now a second edition is available from Macmillans (St. Martin's Street, London, W.C.2) at 20s. A really excellent book of great erudition and tremendous range, it is a splendid present for one's favourite friend—especially if that is oneself! The book encompasses the history of science from the very beginning of civilisation to the present atomic era. But this is no mere statement of dry historical facts. The author traces the *causes* of the particular development of science, and shows clearly and intriguingly how scientific progress is essentially related to the state of the world socially and economically. A plethora of illustrations—many of them rare—and charts forms an important accompaniment to the text, which is in scholarly and eminently readable style. Very highly recommended.

The Focal Press (31 Fitzroy Square, London, W.1) is well known among photographers for their down-to-earth attitude to the science of taking pictures. Never better was this expressed than in their recent 25s. book, **PHOTO-TECHNIQUE**, by H. J. Walls, B.Sc., Ph.D. This is a very big book, profusely illustrated and carefully indexed. From beginning to end it deals in a straightforward, no-nonsense way with all the principles and techniques that can turn a mere snap-shooter into a fully trained and expert craftsman. After a brief but detailed resume of the physical basis of photography, the book goes on to deal exhaustively with such matters as colour work, exposure, artificial light and sundry other basic matters. Then it covers different types of cameras and accessories, and finally, has a big section on the proper use of the camera. The illustrations have been carefully selected to make clear exactly what is described in the text. A remarkable book, worthy of the highest recommendation.

FICTION

MARTIN MAGNUS, PLANET ROVER, is a wonderful man; the Space Force cannot get on without him; he is sent to deal with all crises, and William F. Temple, who wrote this book, certainly finds some for him! The publishers claim that the book has "a scientific background that is accurate in detail"—which it definitely has *not*. There is water on the Moon (water which emits an acrid gas), oxygen on Venus, decapods of enormous size living in underground lunar caverns and a number of other scientific absurdities. Still, the story has pace, is full of action and makes very enjoyable reading. It is published at 7s. 6d. by Frederick Muller (Ludgate House, London, E.C.4).

THE GREEN PLANTATIONS, by John Elton, is really a love story with science fiction trimmings. Earth is invaded, conquered and ruled by aliens who need a constant supply of a special vitamin that can be grown only on their own planet. Naturally,

the easiest way of overthrowing the aliens is to destroy their vitamin plantations, and that is the plot. Not at all a bad story, though. Published by Ward Lock (143 Piccadilly, London, W.1) at 9s. 6d.

C. S. Lewis is well known for his use of science fiction to put over a bit of morality, and in **THAT HIDEOUS STRENGTH** he does it again. So, if you are looking for straight science fiction, this is not for you. It has many elements of fantasy and is apparently a vehicle for presenting in a newish light the age-old problem of what is good and what is evil. A most interesting, but not very exciting, book. Recommended. Published by Pan Books (8 Headfort Place, London, S.W.1) at 2s.

In **TIMELINER**, Charles Eric Maine seems to have wrung one more variation on his story *Highway 1*, which first appeared in *Authentic* No. 39. After we published it, the author lengthened it into a radio play which the B.B.C. put out in February, 1954. It is now a novel and will soon be filmed. But in each presen-

tation there is something fresh and original. Maine, who wrote the highly successful play-novel-film *Spaceways*, always does a first class job of work and does not merely rehash the old piece. *Timeliner* is fully as good as *Spaceways* and is one of the few really credible time travel stories. It is mature, exciting, thoughtful and polemic. You *must* read it. Published by Hodder & Stoughton (St. Paul's House, London, E.C.4) at 10s. 6d.

Museum Press, we are pleased to see, have started putting out really good science fiction again. The latest is **WORLD OUT OF MIND**, by J. T. McIntosh, a really splendid book whose plot we cannot adequately describe here, but which is of that hypnotic type that keeps you reading page after page when you know you ought to go to bed. Fine writing and careful structure characterise McIntosh's novels, and this is no exception. It is nicely embellished by a jacket cover painted by an artist familiar to *Authentic* fans—the best cover Museum have had for

some time. This book is essential for serious science fiction fans. Museum Press (26 Old Brompton Road) put it out at 9s. 6d. (Incidentally, Museum will be bringing out a British edition of McIntosh's *One in Three Hundred* early next year. We reviewed this in our November issue and said it was a *must*. Congratulations, Museum!) *

The fourth series of **THE BEST SCIENCE FICTION STORIES**, edited by E. F. Bleiler and T. E. Dikty, comes out in a British edition from Grayson & Grayson (16 Maddox Street, London, W.1) at 9s. 6d. This contains thirteen good stories that it is nice to have in permanent form, all by well-known American and British authors. A recommended volume.

Another anthology, **THE BEST FROM FANTASY AND SCIENCE FICTION** is a collection of stories from one of America's top-flight magazines. Sixteen stories grace its pages with wit and charm, and literary expertise. You should get it—from Doubleday (575 Madison

Ave., New York 22, U.S.A.) at \$3.50.

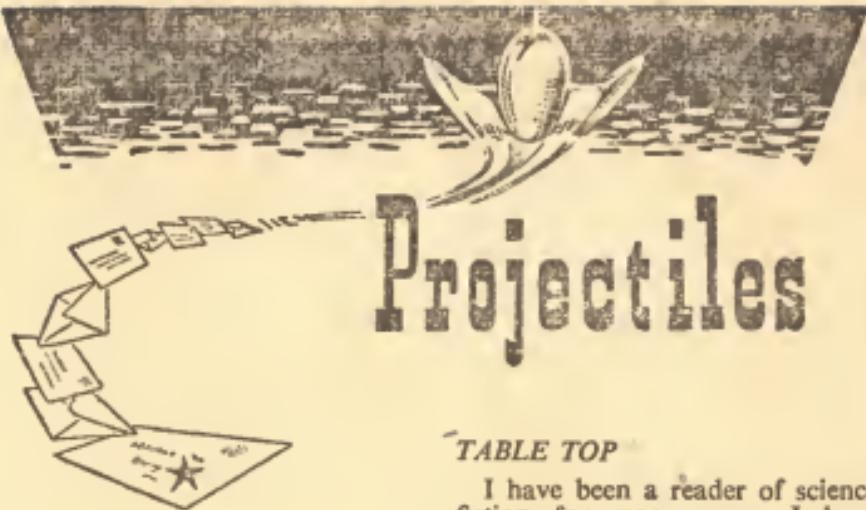
John Carnell, editor of the elegant *New Worlds* magazine, has selected eight stories from past issues and Boardman (14 Cockspur Street, London, S.W.1) has put them out in **THE BEST FROM NEW WORLDS** at 2s. These are stories by British authors—bit of a change!—and they are well worth reading. Seldom does one find so cheap a book having so much good material in it. With it, Carnell is living up to his reputation of being a discriminating anthologist. Strongly recommended.

Two classic American novels have been brought out over here by Nova Publications (2 Arundel Street, London, W.C.2), at only 2s. each. One is A. E. van Vogt's **THE WEAPON SHOPS OF ISHER** and the other is Wilson Tucker's **THE CITY IN THE SEA**. Both are strong meaty stories, full of interest and suspense, but both tending a little towards the immature and fanciful. They are probably none the worse

for that, and you are recommended to buy them.

Edgar Rice Burroughs keeps on cropping up all through the years, a testimony to the popularity of his plots, perhaps, for his writing is extremely dated. The latest reprint is **THE MASTER MIND OF MARS**, put out by W. H. Allen (43 Essex Street, London, W.C.2) at 2s. The publishers could have chosen a better cover but not a better story. This one has the essence of Burroughs—the mystery, the romance, the earthy charm interwoven with supernatural beauty, and the inevitable unfolding of the plot that grips. Here's the chance to read again one of the earliest science fiction stories.

(NOTE: The Science Fiction Book Club begins its third year with a price reduction from 6s. to 4s. 6d.—a welcome innovation, we are sure. The next three books to be issued by the Club are John Wyndham's *The Kraken Wakes*, Ray Bradbury's *Fahrenheit 451* and Arthur C. Clarke's *Childhood's End*.)



OVERSEAS SECTION

FUTURISTIC

I have got up to February, 1954, issue (from 1952). Have been reading back issue which I got about four days ago. Have missed out on *Authentic* because about three or four years ago I got about thirty or forty British S.F. books, same size as *Authentic*, and they were *trash*. But *Authentic* has really improved *amazingly*. I am enjoying *Process*, by Hickey, so much that it made me get out pen and paper to write you. I would like to see more stories of the believable future. In other words what may happen, scientific, mental, social, economic development. Space travel at a minimum—possible only to Moon. Stories on this Earth, no miracles, except O.K. when fantasy rather than science. Ted Forbes, 2505 Champlain Street, N.W. Washington 9, D.C.

Glad to hear from you, Mr. Forbes. And by now you will see that we frequently have articles about the future.

TABLE TOP

I have been a reader of science fiction for many years. I have followed both fiction and fact very carefully. Recently my friend, a photographer, and myself decided we would do some table top photography and the subject we chose was man's first landing on the Moon. I thought you might be interested in our effort so I am enclosing a copy of the photo. I appreciate there are several faults in the photo. The two most outstanding are the Earth is too dull and then so are the stars. Now to give you a few details of the spaceship and the set-up in general.

First the ship. It was made from a table tennis ball for the crew compartment, one sixteenth inch diameter dowel for the frame, the sixteen rocket motors are made from small paper cones; and the fuel tanks, the four on the ship and the two on the ground, are discarded pen cells. The landscape was made from pieces of rock and sand (Egyptian) on a base board about three feet square. The sky was a large piece of film backing paper with a white half-disc glued on for the Earth and pin holes for

the stars. These were illuminated by a 100 watt bulb behind the paper. The whole set-up was lighted by a 500 watt bulb in a reflector three feet from the ship. The design of the ship was inspired by the books by Clarke and Willy Ley, and the landscape by Bonestell. I hope you like our effort. I may do more of this type of photography in the future; if so I will send you further copies. I decided to send a copy to the best S.F. mag.—here is the copy.

584740 Cpl. Hall, J. E., 32 Sqdn., R.A.F., Kabrit, M.E.A.F. 15.

A fine effort, corporal, but your lunar landscape is not sharp enough for reproduction. Many thanks for sending the print, and we'd love to see any more you make. What about having a go at an artificial satellite?

HEART v. MIND

The questions of Nationalism and World Government raised by Peter Summers and David Stevenson in connection with law and power seem to me to miss the vital issues—excepting, perhaps, Mr. Stevenson's very general reference to guidance by God. As a general rule we plan, not law, but responsible privilege, parliamentary privilege and sovereignty at the head of our institutions and governments. These qualities or values are really a freedom from law, though not, of course, irresponsible freedom, anarchy or chaos. The old Hebrew philosophy of enforcing the letter of the law so accurately reproduced by dictatorships is, on the whole, strongly reinforced by the insistence of

science upon causation and strict physical law. But this is open to question. The interaction and limitation of a mass of individual laws derived by analysis can never replace the qualities and values of design, form, stability, harmony, entropy, rhythm, etc., of a composite structure because these qualities are the "cause" of the interaction and limitation. They stand, like responsible privilege, beyond and behind law. Nor are these qualities purely philosophical conceptions. The theorems of stability in the solar system enunciated by Lagrange and first established by Laplace are just as real as those relating to space, time and energy.

R. Carvier, Imperial Hotel, Parramatta Road, Leichhardt, Sydney, N.S.W.

We beg to disagree, Mr. Carvier. While the individual may well plan his life according to his own pre-judicial opinions of design, form, harmony, etc., the only successful method of running large communities is on a rational basis—and that means an acceptance of the axioms of universal causation. All else is irrational, by definition. Irrationality is a privilege for the private individual, not for the public servant. By all means take your pleasures from emotional entities, but if you have to direct the lives of other people then let your direction be based on scientific principles. Perhaps a man's most civilised quality is his ability to make his primitive emotions subservient to logical necessities.

RAISON d'ETRE

I am a science fiction fanatic, and I consider your magazine the best and always look forward to the next issue. I did not agree with Mr. J. Blair's *What was That* in *Authentic* No. 49, and would be happy if you would publish my views why I think space travel should eventuate.

1. The world is rapidly becoming overpopulated by the increasing elimination of diseases, sickness, starvation, etc., and must seek new colonies. 2. Man has wondered and gestulated about the stars since evolution of reason, and will conquer space even for no better reason than to satisfy his own curiosity. 3. Some planets, due to a difference of basic elements in their composition from Earth, might be quite willing to exchange uranium for salt on a pound for pound weight basis. Who can deny the advantages to Earth such a trade would be? 4. The knowledge gained from space travel will vastly compensate any finance spent on this venture. 5. I believe space travel will do more than any action or conferences to unite the world when ruling powers of this little grain of sand called Earth, lost in a beach called the Universe, which in itself is only what the human eye with the aid of the most powerful telescope can discern, eventually get a true perspective of themselves and the world they aspire to dictate to.

D. Stuart, c/o Empire Hotel,
Roma, Q., Australia.

We agree with you entirely that space travel will come about. But you have left out a very significant reason—military.

HOME SECTION

BEST

I have been reading S.F. of all types for some while, but from the time you published *Space Beam*, *Dark Side of Venus* until *Authentic* No. 42, I had completely lost touch with what, in my opinion, is "tops" in S.F. in the U.K. Of all your featured novels since No. 42 *The Envied*, No. 51, is unsurpassed. It is by far the best of any of your some forty-four stories. I have read much in your Projectiles about the story by R. C. Wingfield, *The Mutilants*, and nothing which I have read has been in its favour, though I myself found it quite interesting. Now the best of your short stories came from E. C. Tubb in the form of *Death Deferred*, *Day of All Else* by Williamson, and from G. Winslow, *Dimensional Destiny*. I like very much your stories of time travel, fourth dimension, etc., all of which have been interesting and made good reading. However, I must make one exception, that is *It's Dark Out There*. After I had read this I had the feeling I had not read the end. It had an anti-climax every other line, so please try and keep this sort of story out of your magazine. *From Earth to the Stars* made an exquisite form of instructive illustration. What's the chance of all the types on the starship being allergic to common substances, i.e., water, wool, wood, nylon, paper, etc.? After all, they have been out for over three hundred years. Hundreds of years of breathing purified, sterilised, filtered air, of living in the plastics, metals and synthetics of their ship. Peter Wilson, Longhirst Lane, Longhirst, Morpeth, Northumberland.

Many thanks for the appraisal, Peter. We tend to agree with you about The Envied and The Mutilants. You must have a great mind! Allergies, we hope, will no longer bother humanity at that date.

SWAPS

I would like to offer through your columns to swap Nos. 35-48 inclusive of *Authentic* for a similar number of paper-covered Panthers (Jon J. Deegan especially). They are, for the most part, in good condition with only one or two slightly battered. I enjoy your magazine very much. In fact, at the moment I have only one small grumble. This is that so many of the stories are treated with a psychological slant. While I do like this sort of story, I feel that the saying "variety is the spice of life" is very true, and would like to see some action stories a bit more often. I am keen on your non-fiction section. I like especially the articles on logic.

J. A. van Dongen,
St. Vincent's Hospital, Eastcote,
Pinner, Middlesex.

No doubt some of our readers will be pleased to make the swaps. Thanks for the praise—and the grumble—both help.

PEN PAL VAL?

This month's *Authentic* has both delighted and annoyed me. First of all, *Authentic* arrived about a week earlier than usual. All very nice you may say, but you don't know our postman. For some reason known only to himself, he insists on pushing my favourite magazine through our letter box—two sizes too small for it. Now, I usually lie in wait for him and

catch him before he does this, but today I was caught unawares. Result—a badly battered *Authentic*. When I finally got the wrappings off I find you've turned out another very nice cover. Full marks for that. Eagerly I look inside for the long awaited supplement. But I'm disappointed. Maybe I expected too much, but I definitely dislike this new feature. You see, I think the high quality paper makes the rest of *Authentic* look common—which it isn't. Sorry if I've hurt your feelings, but there it is. Now I'll make a practical suggestion. Once upon a time I worshipped *Authentic* because not only did it contain very good stories and articles, but it was the only magazine of my experience which didn't contain any of those infuriating, inane adverts on how to stop smoking, gain personality, lose "that frustrated feeling," etc., etc. When, just recently, you blotted your copybook I was disappointed. However, I realised that adverts mean money, and I forgave you. Now that you have money to throw around won't you please get rid of those terrible adverts? If you still have any spare cash then concentrate on improving the whole appearance of *Authentic*. Let's have a slightly better quality of paper throughout, not just a few pages of top quality and the rest of very much inferior standard. You can't improve the reading matter, but you can improve *Authentic's* looks. And when you get letters from anyone who rates *Authentic* as anything but the best S.F. magazine going, just send him away with a flea in his ear, will you? By the way, if any part of this letter is lucky enough to get printed I'd like to say that I very much want a pen

pal, preferably one from Australia. I'm seventeen years of age. Any-one interested?

Valerie Andrews, 4 Cornwall Ave, St. Mary's Estate, Byfleet, Surrey.

We haven't got that much money to throw around, Valerie! Besides, though we don't doubt that you are an exquisite creature whose nose is pert and pretty, think of the poor unfortunates who wear a turnip between their eyes! (Coming to the Convention?)

FANS!

As you see from the new address, they got me at last! You ask what soured me on fandom—and answer your question when you say there was no response to the fan-group series. Fandom is too erratic, even for me. It consists of a large number of people tearing around frantically, and getting precisely nowhere. While one is in it, it seems frightfully important and marvellous. But if you slip out, the intoxication goes, and the reaction makes you think what a waste of time it was, to no purpose or lasting merit at all. It's very useful to keep in touch with fandom—no reader of S.F. should neglect, but you save a lot of energy, time and money if you stay out of the merry-go-round. 2738154 A.C.2, Sowerby, P. L., Hut 196, "6" Flight, B Squadron, L Wing, 11, S of R.T., R.A.F., Hednesford, Staffs.

Well, now, Paul. We're not going to say anything about this. But we'll bet that some other readers will!

STAR CREWS

Your covers are very good, but you mention motors that go for

umpteen hundred years, O.K. But meanwhile, what about the crew? Have they achieved immortality? Or are they in a state of suspended animation? They can't be either of those, so they must be robots! Are they?

Leslie C. Jefferson,
15 Norman Row, Leeds 5, Yorks.

No! They are dead—at least, they die at a normal age. Their children take over from them. Surely we made it clear that several generations will be born and will die on a starship before it reaches its destination.

PROBLEMS

In my armchair I have crossed a new frontier. A young friend gave me a tattered copy of *Authentic* (No. 45) and opened, for me, a hitherto closed door. Alas, I find that in my ignorance I have missed much. Vaguely have I heard of science fiction, yet I find a S.F. magazine titled *Authentic!* Sir, I am puzzled by two things. Firstly, what is your definition of authentic? Secondly, and the more important, to further my sad lack of education in this field I intend to explore thoroughly, how can I explain the strange terms used in science fiction?

J. Gardner, 5 Ashley Drive, Boreham Wood, Herts.

*We defined science fiction (which is probably what you are after) in the editorial of No. 32. Regarding terms—if you, or anybody else, takes out a subscription to *Authentic*, you will receive free of charge a *Science Fiction Handbook* which explains all the terms you are likely to come up against. Best wishes to you in your new-found pleasure.*

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